IN THIS ISSUE—Del Monte Convention of Electrical Supply Jobbers Association

JOURNAL OF ELECTRICITY

VOL. 44 NO. 9 SAN FRANCISCO, MAY 1, 1920 PER COPY, 25 CENTS

Thor
Made Right—Sold Right
In the lead for fourteen years and still far ahead. That is the best evidence of Thor quality and popularity, and positive proof that the Hurley-Jobber-Dealer Co-operative Sales Plan brings the desired results.
HURLEY MACHINE CO.
CHICAGO NEW YORK TORONTO
PACIFIC COAST DISTRIBUTORS
PACIFIC STATES ELECTRIC CO.
Los Angeles Portland
San Francisco
Oakland Seattle

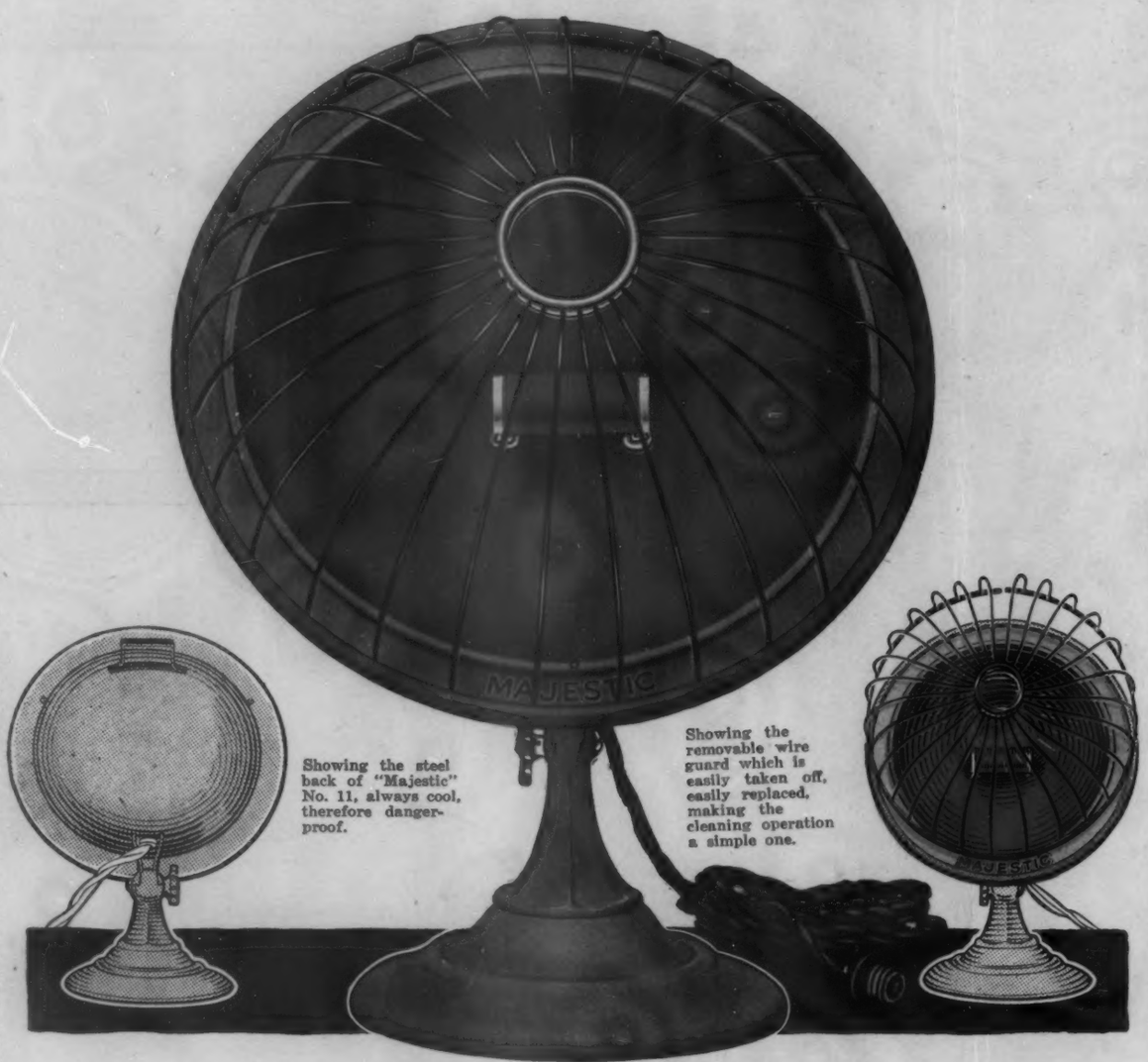
LIBRARY OF CONGRESS MAY 19 1920

A New Addition to the "MAJESTIC" Line

"MAJESTIC" No. 11

A Sure Winner

A chill-killer, a glow-bringer, a comfort-maker



Showing the steel back of "Majestic" No. 11, always cool, therefore danger-proof.

Showing the removable wire guard which is easily taken off, easily replaced, making the cleaning operation a simple one.

"MAJESTIC" No. 11 — The Heater That Defeats Winter

Dimensions		Equipment
Height	19¼ inches	8-foot heater cord with separable attachment plug. Heating element guaranteed for one year. Reflector pure copper burnished.
Diameter	14½ inches	
Weight	7½ lbs.	
Shipping weight	10½ lbs.	

There are, besides "Majestic" No. 11, six other styles of "Majestic" portable heaters and three stationary, or insert types

"MAJESTIC" ELECTRIC DEVELOPMENT CO.

Manufacturers and Patentees

KANSAS CITY SAN FRANCISCO PHILADELPHIA

"MAJESTIC" Electric Heaters——Best in Creation for Heat Radiation

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor

VOLUME 44 | SAN FRANCISCO, MAY 1, 1920 | NUMBER 9

Contents

EDITORIALS 409

The Electrical Industry and the Jobbers Convention—El Camino Real—The Foreign Trade Convention—Automatic Generating Plants—Transmission of Oil Through Pipe Lines—Difficult Motor Installations—The Crop Outlook in the West—A Group Selling Plan for Utility Bonds—The Department Store and the Hardware Store—Increase in Governmental Salaries Needed—Journalism in Engineering and Technical Schools.

THE CONTRACTOR-DEALERS OF EL CAMINO REAL N413

A survey of the electrical contractor-dealer shops of the state of California, reviewing particularly the improvements which have been brought about by the California Electrical Cooperative Campaign.

DEL MONTE CONVENTION OF THE ELECTRICAL SUPPLY JOBBERS' ASSOCIATION 421

The complete program of the convention of the Electrical Supply Jobbers' Association, which is to take place at Del Monte, May 11-14. The pictures of a large number of the leaders in this branch of the electrical industry illustrate the article.

ELECTRICAL SUPPLY JOBBING BUSINESS OF THE WEST 424

A brief resume of the principal jobbing houses which make the West a leader in the electrical supply jobbing business of the nation.

THE COMMERCIAL INSTINCT — by S. M. Kennedy 429

In this eleventh article of the series, the author analyzes the value of a constructive imagination to the electrical salesman, pointing out the great opportunities open to the resourceful man in this branch of the industry.

REMOTELY CONTROLLED HYDROELECTRIC SYNCHRONOUS GENERATOR UNIT — by Charles H. Tallant 432

An account of the recent installation of a remotely controlled synchronous generator hydro plant made by the Ontario Power Company of California. This is the newest idea in control stations practice.

THE HYDRAULICS OF OIL PIPE LINES — by W. F. Durand 434

A scientific discussion of the fundamental problem presented by the flow of viscous liquids in pipes, especially noting the possibility of treating actual prbolems as they arise in connection with the design and operation of oil pipe lines.

CHOICE OF ELECTRICAL EQUIPMENT FOR GOLD AND SILVER MINING — by B. B. Beckett 440

An article on electrical equipment of mines which analyzes in detail the problems which arise and proposes cures to these troubles.

THE VELOCITY OF PROPAGATION OF GRAVITATION — by A. C. Crehore, Ph.D. 442

A paper by the author of The New Physics, in which he discusses the question as to whether the force of gravity is instantaneous or whether time must elapse before this force becomes effective.

The Modern El Camino Real—Frontispiece 408
Office Records—Their Filing and Indexing—by Irene Warren 427
Western Ideas 428
The Foreign Trade Convention 444
Sparks 445
Personals 446
Meeting Notices for Electrical Men 448
Happenings in the Industry 451
New Electrical Developments 453
Vacuum Cleaner 455

PUBLISHED SEMI MONTHLY BY THE

TECHNICAL PUBLISHING COMPANY, Rialto Building, SAN FRANCISCO, CAL.

WILLIS M. DEMING, President & General Mgr.
ROBERT SIBLEY, Vice-President & Editor
ARTHUR H. HALLORAN, Secretary

NEW YORK, Tenth Ave. at 36th St.
WASHINGTON, D. C., 610-611 Colorado Bldg.
CHICAGO, 1570 Old Colony Building
PHILADELPHIA, Real Estate Trust Building
ST. LOUIS, 713 Star Building
CLEVELAND, Leader-News Building
SAN FRANCISCO, Rialto Building
LONDON, E. C., 6 Bouverie St.
BUENOS AIRES, Calle Corrientes, 685

OWNED BY McGRAW-HILL COMPANY, INC.
Publishers of
American Machinist
Electric Railway Journal
Engineering and Mining Journal
Power — Coal Age
Chemical and Metallurgical Engineering
Engineering News-Record
Ingenieria Internacional
and of
THE ELECTRICAL TRIO:
ELECTRICAL WORLD —— JOURNAL OF ELECTRICITY —— ELECTRICAL MERCHANDISING

Copyright, 1920, by Technical Publishing Co., Inc. Issued on the 1st and 15th of each month. Entered as second-class matter Jan. 1, 1917, at the Post Office at San Francisco, under the Act of March 3, 1879. Subscription Rates in United States, Mexico, Cuba, Porto Rico, Hawaii and Philippines, $2.50 per year. Canada, $3.25. Elsewhere, $4. Single copy, 25c. When change of address is required, both old and new addresses must be given. Notice must be received two weeks before change takes place.

Member Audit Bureau of Circulation

Index to Advertisers—page 28 Where to Buy in the West—pages 29-33

THE MODERN EL CAMINO REAL

A VAST double system of highways extending through California in parallel column a thousand miles in length from the Mexican border on the south to the Oregon state line on the north, constructed at a cost of one hundred million dollars, constitutes the modern El Camino Real or Royal Highway, which breathes the traditions of the early Mission life in California. The view is a part of the ancient El Camino Real founded by the early Spanish fathers but now made over into the modern California Highway. Along this stretch of road for hundreds of miles north and south are located contractor-dealer stores which today, under the invigorating influence of the California Electrical Cooperative Campaign, are making history and tradition for the electrical industry in the West and, as a model after which to pattern, for the industry as a whole throughout the nation.

MAY 1 1920

©CLB460017

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44 SAN FRANCISCO, MAY 1, 1920 Number 9

(Copyright, 1920, by Technical Publishing Company)

The Electrical Industry and the Jobbers Convention

THIS is the year of years for conventions in the West, but to our industry it has an unusual message of cheer and inspiration. The first of three great national conventions for the month of May is to convene at Del Monte, California, May 11th to 14th, 1920. Nine years have come and gone since the Electrical Supply Jobbers' Association held its convention in the West. These nine years have seen tremendous changes, vast forces at work, and new and interesting developments in the application of electrical energy; but beyond all physical attainment, engineering design, or achievements in installation, wonderful as these have been, the progress of the West in the merchandising of electrical ware has been unsurpassed. It is, as a consequence, with unusual pride that we welcome to our midst these men, captains of industry in the merchandising of electrical products, and invite them to the great playground of the nation and to see what the modern ideals of cooperative effort in electrical lines have accomplished west of the Rockies.

A hundred years ago the old Spanish Fathers traversed this state along the royal highway, or, as they called it, El Camino Real. Today, with vast highways stretching for eight hundred miles from the north to the Mexican border on the south, these great highways studded with hamlets and villages enable one to see a display of contractor-dealer effort in the merchandising of electrical ware that is unique and unusual in its setting, and of high attainment in ethical development.

And so we welcome you to our midst, and trust that before you leave our borders you will make the effort to look into these new and interesting developments that prevail throughout the length and breadth of the West, and see for yourselves the high ideals of attainment that have been wrought in the field of electrical merchandising. And, while we know that from you we shall learn many a well-taught lesson based on your wide and extended business experience throughout the nation, yet we trust that in a measure it may be our privilege to leave with you a message that may be helpful and instructive when on the morrow you must return to your busy activities in far distant corners of the nation.

El Camino Real

The traditions of California are so interlinked with that of the early mission life that El Camino Real, or the Royal Highway, is known and revered in all countries and lands where the early life of California is known and enjoyed. A hundred years ago as these Spanish Fathers journeyed up and down the length and breadth of California they saw a sight no fuller in vision and no more worthy of mention than that of the modern El Camino Real of California, winding its way over hills and vales for a thousand miles from north to south, a fine example of modern design and engineering skill.

The contractor-dealer stores that today line this modern El Camino Real are indeed progressive and interesting and it is with no small sense of pride that we exhibit elsewhere in this issue some of the modern adornments of El Camino Real throughout the length and breadth of California. And it is to be said that to the vision and ability of the Cooperative Campaign movement great credit is due for what has been done in this regard.

The importance of the motor truck and the automobile in the life of the West have brought back the roadways to their own and today the two great highways of California not only provide a convenience of social intercourse between communities, but much actual commerce is carried on over their length.

Following the variations in topography and interest which mark the sections of the state thus connected by El Camino Real, local centers have developed each with a character and life of its own. In most cases this is very closely bound up with the electrical industry both on the farm and in the home, thus offering a varied but uniformly receptive market for electrical ware.

The Foreign Trade Convention

As these pages are about to go to press, there seems to be every indication that the forthcoming convention of the Foreign Trade Club to meet at San Francisco, May 12th to 15th, will be an unquestioned success. There are many outstanding features that will make this a convention long to be remembered. The powerful bankers, influential manufacturers and commercial

men who have already promised their attendance at this convention come from all ports, not only of the Pan-Pacific countries but from every quarter of the globe.

Among the subjects that will be discussed at the convention are those of shipping, port facilities, standardization of money, new industries, and the effect of the development of foreign trade intercourse to a more intensive degree upon Pacific Coast ports and internal development. Far exceeding all other questions of discussion, however, will be that of stabilizing foreign exchange. There is a crying need of the hour that something be done to correct the present disadvantage under which we labor. This country seems to be at present overstocked with gold, and foreign countries seem to have an inability to keep their exchange rate such as will put their citizens on a reasonable basis of commercial intercourse with America. If our foreign commerce is to thrive, we must have this problem settled once and for all, and placed upon a sound footing that will give neither advantage nor disadvantage to us. We seek the friendship and commercial intercourse with all nations of the world, and in the sincerity with which we believe in our wonderful possibilities for future growth in international relations, let us do all that is reasonably possible to bring about the stabilization of foreign exchange. It is believed that those who are in attendance at the forthcoming convention in San Francisco will be given an unusual opportunity to express themselves along these lines, that will unquestionably prove of great timely helpfulness.

Automatic Generating Plants

All of the power companies, especially those in the West, are vitally interested in the development of automatic station equipment which will tend to reduce the cost of operation by decreasing the labor charge. In this connection the article appearing in another art of this issue by C. H. Tallant, describing the new automatic generating plant of the Ontario Power Company, in Ontario, California, is of more than usual interest. This plant is the first of its character to be installed in the West and there has been only one other similar to this installed previously anywhere. This particular plant has been operating successfully for several months and the designers are to be congratulated that the first installation has operated successfully without numerous changes and rebuilding.

Of probably more importance than the installation of new automatically controlled generating plants is the problem of converting present manually controlled generating stations into automatic control. There are dozens of small synchronous generating plants in the West which could and should be converted to automatic operation. If this were done the excessive cost of operation would be reduced so that these plants could compare with the economy realized in the largest and most modern plants. It is interesting to note that the Southern California Edison Company is, at the present time, undertaking the conversion of a number of its small synchronous generating plants from manual to automatic operation and the progress of this test will be watched with the greatest interest. The equipment necessary for this purpose is comparatively simple, providing good judgment is exercised in the solution of the problem after the fundamental requirements are known. At the present time a two-unit plant, in first-class operating condition, may be changed to automatic control at an expense of from one and a quarter to two times the annual saving in labor cost within the plant. This means a return of from 50 to 85 per cent on the investment.

Transmission of Oil Through Pipe Lines

The two articles by H. W. Crozier on Oil Pipe Line Transmission which appeared in the Journal of Electricity of January 1st, 1920, and February 1st, 1920, have attracted such wide attention that we take this occasion to call attention to an article appearing elsewhere in this issue of the Journal of Electricity on the same subject under the authorship of no less an authority than W. F. Durand, professor of mechanical engineering at Stanford University.

Mr. Crozier, as author of the two former articles mentioned, dealt in a very practical and helpful manner with various empirical formulas which prove readily applicable to the designing of pipe lines for the transmission of oil from the oil fields to the point of transportation either by steam or over rail. The growing uses of fuel oil and the necessity for the utmost economy in transportation, thus bringing about a reduction in the cost of the product, is a continually pressing problem, and, as a consequence, anything that can add to our present knowledge on this subject is both timely and of unusual value.

In the article in this issue by Professor Durand, the author finds that eight characteristics or factors enter fundamentally into any subject connected with the conveyance of liquid, or fluid, through pipe lines. Thus he finds that the viscosity of the liquid, the density of the liquid, the diameter of the pipe, the length of the pipe, the roughness of the pipe surface, the velocity of flow, the gravity constant, and the loss of head in feet as measured by the difference of pressure between the two ends of the pipe line, constitute the factors upon which the hydraulics of oil pipe lines must be based. The remarkable outcome of Professor Durand's investigation is the tabulation of formulas that may be used not only for oils but also for air and water, thus coordinating and correlating the present literature we have on this important subject.

The subject of viscosity of oil has long been one of a perplexing nature, and in this article Professor W. R. Eckart of Stanford University points out that the relation between viscosity and temperature when plotted on the double logarithmic scale shows a close approximation to a straight line, at least over the working range of temperature for which the liquid may be said to retain its identity. Using this relationship, Professor Durand has been enabled to compute certain fundamental constants that aid very materially in giving practical application to the for-

mulas he has derived. The procedure he has outlined undoubtedly will lead us to more accurate information than can possibly be brought about in the use of empirical formulas hitherto applied in oil pipe line design. The transmission of oil through pipes, not only over long distances, but also in the boiler rooms and from the storage tanks to the power house interior, involves problems which are daily becoming more pressing. It is believed, as a consequence, that the contribution of Professor Durand in this issue of the Journal of Electricity will add vastly to our present useful knowledge on this important question.

Difficult Motor Installations

Among the most difficult locations in which to install and maintain electrical equipment, especially motors, is that of mines. In another part of this issue B. B. Beckett points out in considerable detail a number of the particular difficulties which appertain to motor installations in gold and silver mines. The general conclusions which may be drawn from his paper are that proper maintenance will almost entirely prevent shut-downs due to failure of electrical apparatus, but that there is yet considerable progress which may be made in the design and manufacture of electric motors for heavy duty and infrequent inspection.

Particular attention must be paid to the insulation which, in mine service, will be exposed to dampness and oil. The difficulty with the oil may, however, be partly eliminated by greater attention to the design of the bearings. The greatest attention should be given to this feature in order to prevent as far as possible the throwing of oil from the bearings.

The Crop Outlook in the West

The close relationship of electrical pumping to crop production makes the present crop situation of vital interest to the electrical industry throughout the West. Summed up briefly, the high prices that the crops yield due to unusual circumstances, particularly in those districts where electrical energy is available for pumping, make the year one of unusual promise for the state. The late rains in March have assured the usual crops and their normal harvest. In the fruit districts where electrical pumping is available the farmers have made use of winter irrigation by thoroughly permeating the ground with water throughout the winter months to an extent that assures safe and substantial crops this year, in spite of its rainfall shortage. Instances of this may be seen in the Lodi district of California where the famous Tokay table grape finds its home. Here the Tokay grape vineyards have been thoroughly irrigated time and again during the winter, and the summer and fall should find them well cared for so far as reasonable moisture supply is concerned. Up and down the delta lands, in the so-called Netherlands of California bordering the San Joaquin and Sacramento rivers, the produce situation is also favorable. Thus it is seen that while the year is one of unusual shortage in rainfall and unusual shortage of power as a consequence, yet in spite of this the districts where hydroelectric energy has been available throughout the year will experience a minimum setback, and indeed in many instances will prove normal in production. As a consequence the unusual prices which are prevailing for forthcoming crops should make the year one of exceptional prosperity in California and the West.

A Group Selling Plan for Utility Bonds

Each day requests of finance, wherewith to meet the crying needs for development of power in the West, become more acute. The instance of the San Joaquin Light & Power Corporation, operating in Central California, is quite illustrative of the present situation. This company, which operates in one of the most flourishing agricultural districts of California, has during the past sixteen years developed a power distributing system, having for a total output some 84,000 horsepower. This is the work of sixteen constructive years; and yet, in one year, the year 1920, this company will have installed 45,000 additional horsepower on its Kerckhoff Plant, 9,000 horsepower on Kerckhoff Junior, 17,500 horsepower additional in steam electric at Bakersfield, and 17,500 in its new natural gas steam electric plant in the McKittrick oil fields, making in all a total additional horsepower of 89,000 more in one year—new installations of power representing a hundred per cent more power than was built up in the total sixteen years prior constructive work.

A survey of the power situation in California divulges the fact that there must enter into this state, within the next five years, a sum not less than $250,000,000. The question then arises as to what is the best and most expeditious way in which this money may be secured. Would it not be a constructive plan for the various power companies to meet together informally, consult informally with the Railroad Commission and with other institutions of California, that might shed a helpful light on the situation, and to see whether a budget of total bonds required might be formulated, and a power deal put through on a group bond selling proposition? The idea is new, yet is vast in possibilities and well worthy of thoughtful consideration.

The Department Store and the Hardware Store

It is interesting to follow the many ramifications of an institution that is founded with the sole purpose of educational effort looking toward cooperation in an industry. With small beginnings in the West, this cooperative movement is now clarifying, purging and cleansing many channels of industry that in former days many questioned and hoped might be purged; but no one saw the means by which this might be accomplished.

Some of the latest possibilities of broadening cooperative effort in the West came about at the recent state gathering of the California Association of Electrical Contractors and Dealers in Stockton. Here the subject was brought up as to the status of

department stores and hardware stores in the handling of electrical ware insofar as the electrical industry is concerned. Men representing these various branches of industry and trade were present, and those who listened to the earnest discussion could not help but feel the inspiration and value to be derived by such gatherings as that held at Stockton.

There are many problems yet to be solved in the merchandising of electrical ware, but it is believed that the Stockton meeting has advanced the industry one peg further in the merchandising of electrical appliances and apparatus in the West.

There is no reason why the channels of trade should in any manner be ever obstructed. Indeed, one may as well try to stop the tides of the ocean as to obstruct the channels of trade.

The hope, then, for the entire situation is that ethical standards be continually raised and put into practical operation in everyday life. Thus the taking of the department store and the hardware store into conference in matters of this sort points the way to a united effort for the good of the electrical industry as a whole, along the lines of the broad-visioned activity that now prevails throughout the West.

Increase in Governmental Salaries Needed

In a recent issue of the Journal of Electricity attention was called to the low salary of the engineers and others of the office class of employes of the public service corporations of the West. The situation of the employes of many, if not all, of the federal government bureaus is probably still more critical, if such could be possible.

The adequate exercise of the many functions of the government and the economical expenditure of the vast sums involved depend upon the ability, efficiency and integrity of the scientists, engineers and other professional men in the executive branch of the government. Men of the type and ability to have and exercise such qualifications cannot be secured for the pay given the office boy or stenographer, nor can their services be retained even though they have the small satisfaction of knowing that their tenure of office is quite secure. This is forcefully brought out by the figures showing the turnover during recent months. With an average personnel of 473 in the technical staffs at Washington and Pittsburgh the period since 1916 has seen a total turnover of 1400; an average of 85 per cent, and a maximum of 145 per cent.

These are startling figures and they have a startling meaning: unless some radical change is made in the very near future a complete breakdown of the civil service structure is in sight. This will result in an appalling waste due to the lack of experienced employes which will far exceed the sums needed to put the service on a businesslike basis and compensate the workers for their services in proportion to the value returned.

The matter is now up to the Joint Commission on Reclassification of Salaries and the findings and recommendations of this body will be watched with interest.

Journalism in Engineering and Technical Schools

The tremendous widening of the horizon of the engineer makes even more imperative than ever before the necessity that he be well versed in economics and in the power of the pen. It is interesting to note, too, in passing, that this same economic advance has very materially widened the market for engineering endeavor in the field of technical journalism. The consequence is that this field today is one of the brilliant opportunities of the future for the young engineer. In view of all this situation, it is rather surprising that in none of the great engineering institutions of the West is there to be found today either a school of technical journalism, a course in technical writing that may be really called such, nor a student paper devoted to the subject exclusively of engineering and technical writing. The University of California, with its ten thousand students enrolled and with its engineering department crowded to the limit, is woefully neglectful in this particular. An instance of what can be done in the way of real technical training is to be found among the agricultural students of the University of California, where a magazine is published known as the Journal of Agriculture. One needs but a few moments of observation of the pages of this magazine to see that it is brim full of life and activity and of wonderful service in formulating the vision of the young agricultural engineer. It is certainly to be hoped that the faculties of our Western engineering colleges and universities will give some thought to bettering this unfortunate situation at the present time.

MAY 15—SPECIAL CONVENTION ISSUE

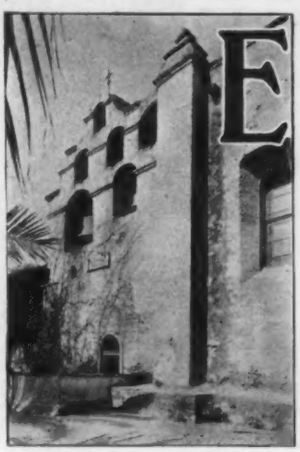
A complete survey of the water power resources and developments of the states west of the Rockies

THE ALAMEDA — A STRETCH OF EL CAMINO REAL AS IT LOOKED IN 1875

All through the history of California, the great highways have been the connecting arteries of trade and inter-community activities. The trees of this section of the "Royal Highway" were planted about the time of the American Revolution by the mission padres.

The Contractor-Dealers of El Camino Real

(The striking improvements of recent months which are to be noticed among the electrical retailing interests of California may largely be credited to the remarkable work of the California Electrical Cooperative Campaign, and this story of the dealers which serve the communities along the highways of the state is offered as a record of the achievements of this organization.—The Editor.)



In the early days of California the Spanish missions outlined a royal highway through the state which today connects a series of ever-growing and prosperous communities.

EL CAMINO REAL, the royal highroad of California, runs from the hill country just north of San Francisco down along the coast as far south as San Diego. In the days of Spanish glory, the road was the main artery of the life of the state, connecting the colorful, tile-roofed towns and busy mission settlements which were strung along its length like beads along a necklace. Just so today the the prosperous local districts are united by the great highways of the state. El Camino Real, itself, concrete paved and tree shaded, marked by the hanging bell at intervals at the roadside, is the great connecting roadway of the coast, while the Midland Trail, with its tributaries leading off to the foothills on either side, runs down through the great central valleys.

Along both these highways are groups of towns sufficiently alike in interest, with the same type of country back of them, so that they constitute a unit. Along the coast these are either formed by the successive little valleys which lead at angles to the sea, or center about a seaport with its numerous activities. In each of these districts is to be found a perfect network of power lines and in each a group of wide-awake electrical dealers who are intelligently serving the needs of their communities.

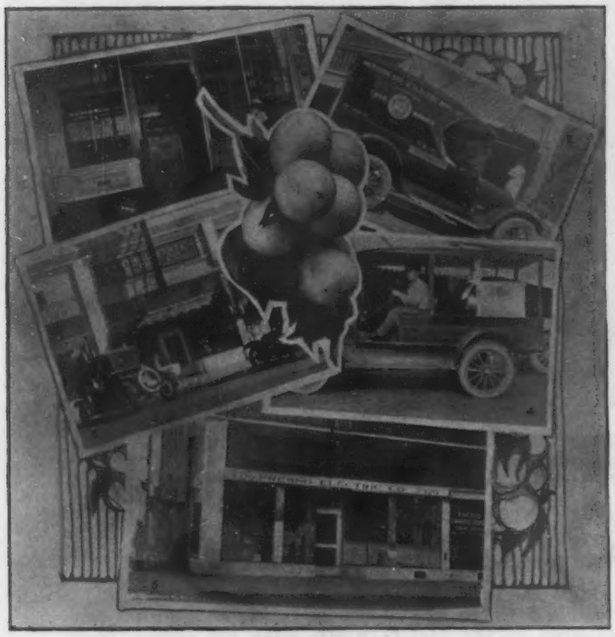
The assistance of these dealers in their own self-improvement, the encouragement of interorganization and cooperation, and the general betterment of the service which is thus given the homes and industries of the state, has been the province of the California Electrical Cooperative Campaign. Three field agents have been kept busy in the field, going from district to district and from store to store, giving practical assistance in the meeting of problems as they arise. The record of improvements which have been instituted and of good feeling which has grown up between dealers and in all relations between dealers and power companies is eloquent testimony to the value of the service thus rendered by the campaign.

Northern Bay Counties

The first of these local districts which forms a little center of prosperity at the head of El Camino Real is the region of the northern bay counties. This is made up of little valleys winding among the hills of the Coast Range, a district of fertile argiculture and of great activity in dairying and poultry. Petaluma, for instance, is world famous for its poultry industry and the extent to which electricity is used in all branches of this work. In this region, too, are found many of the scenic features of the state and such natural wonders as the petrified forest, mineral springs, redwood forests and hill streams that bring motor parties and vacationists from all over the state. Particularly in that part of the territory which stretches down the eastern side of the bay, a considerable industrial activity has arisen, while Vallejo, of course, has the special interest of Mare Island Navy Yard.

An idea of the live character of the electric service which is being given this region is to be seen from the records of the California Electrical Cooperative Campaign, which report two new establishments within recent months, one that of F. C. Sherman in Rio Vista and one opened in Fair-

field by M. E. Parr. In Petaluma, where Bauer and Baugh and the Petaluma Electric Works serve the city, both electric stores have rearranged and improved their establishments. In Napa, Earl G. Wilson has rebuilt the interior of his store and added to his service by the employment of a sales-manager. Santa Rosa has two electric stores of importance,



FROM THE NORTHERN CALIFORNIA DISTRICT

1. The new store of Bauer and Baugh of Petaluma. 2. The Western Gas and Electric Company of Chico believe the delivery truck is an effective medium for advertising. 3. The Central State Electric Company of Fresno have doubled the size of their store. 4. Delivery truck of H. W. Jacobs, Santa Rosa. 5. The attractive new quarters of the Fresno Electric Co.

the Hayes Van Fleet Electric Company and H. W. Jacobs, and both these have greatly improved their working plant. The Solano Supply and Construction Company of Suisun has doubled the size of its store and added great improvements. These are only typical of the enterprise and progress which mark the district.

The Bay Region

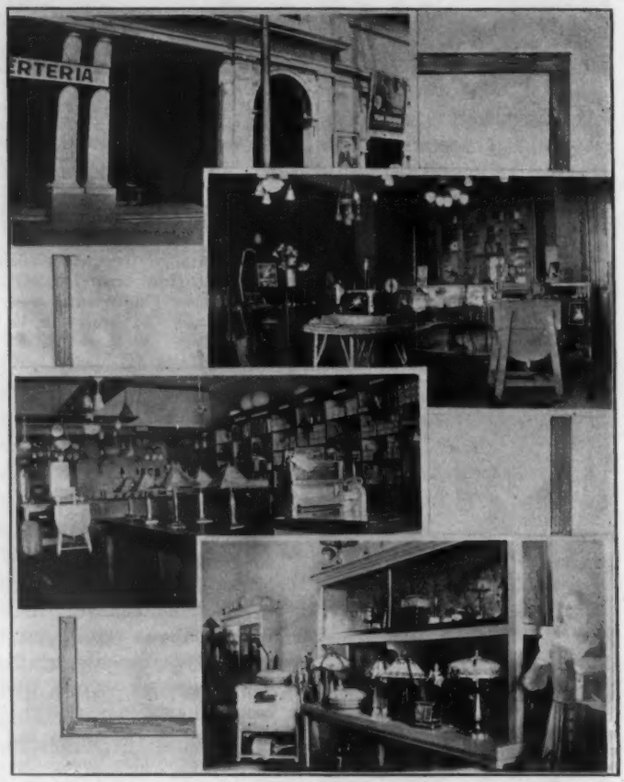
San Francisco, Oakland and Berkeley hardly need characterizing. Active groups of dealers cover these communities and live local contractor-dealer organizations meet inter-industry problems. New stores are continually growing up, both to meet the local requirements of residence districts and in the downtown section.

Just outside of San Francisco is a semi-suburban district which runs down through an area of industrial interests represented by South San Francisco to the residence district farther down the peninsular, just bordering on the agricultural region immediately beyond. Part of the electrical needs of this region, particularly that represented in the industrial center bordering the city are met by trips into San Francisco itself, but more and more the local dealers are taking over the business. In Burlingame the new Watts Electric Company with its pleasant interior and well decorated window is meeting the larger as well as the smaller household needs of its well-to-do residence district. J. A. Foster of San Mateo has made numerous improvements in his already attractive establishment and has been carring out an active solicitor campaign. Redwood City is adequately served by Mark E. Ryan, who takes an active part in civic affairs as fire chief and city father, as well as handling all electrical business of the community.

Alameda County

The similar district outside of Oakland runs more promptly into an agricultural region. Some industrial interests and factories fringe the outskirts of the city and then follows a region of vegetable farms, fruit ranches and hay fields. An interesting feature of the region is the Portuguese settlement about Elmhurst, which is said to be the only settlement of this nationality in the United States.

Along the highway which unites these communities are located sucessive contractor-dealer establishments, each serving a given territory hardly overlapping that of the next division of the chain. Each store handles practically all the electrical interests of its districts—and the general use of electricity for household convenience as well as in the lighting of the homes is a tribute to the dealers who developed the interest and supplied the wants. Typical of the improvements which have been made in this district recently is the Andrews Electric Company of Elmhurst which has moved to a new location with a better working plant and tasteful



CONTRACTOR-DEALERS OF THE OUTLYING BAY DISTRICTS

1. The L. E. Morgan Electric Shop of San Leandro is located half-way between the office of the power company and the leading moving picture theater. 2. In Elmhurst the Andrews Electric Company has moved into well-arranged new quarters. 3. Mark E. Ryan of Redwood City has an open, well stocked store where he handles the complete electrical business of the community. 4. J. A. Foster of San Mateo has chosen gray and mahogany as an appropriate background for appliance displays with excellent effect.

fixtures. The shop is open and well arranged and a well chosen stock covers the demand of a growing industrial and farming region.

The L. E. Morgan Company of San Leandro has an extremely favorable location between the office of the power company and the principle moving picture show. Mr. Morgan has been greatly increasing his contracting business to meet the building prosperity which has marked the last few months. The store of Jacob Harder, Jr., of Hayward, also shows many improvements. The interior is artistic and effective in arrangement and flowers and a convenient chair help

to make it friendly for the customer. A large industrial business is handled by L. A. Vieux of Niles, where a fruit-packing plant of some size dominates the activities of the neighborhood.

Dealers of the Santa Clara Valley

The Santa Clara Valley district proper is well known for its specialized prune industry. Aside from the agricultural prosperity of the region, it is one of the beauty spots of the state and many beautiful residences mark its length, from Los Gatos to Palo Alto. The Blossom Festival of the spring and the charm of the surrounding hills in the summer make it a favorite spot for visitors and many resorts have grown up to care for this business.

Palo Alto is of course largely centered about the interests of Stanford University and its needs and activities are those of a college town, with seasons which follow closely the opening of the college terms. The Stanford Electric Company here specializes in household appliances and keeps several solicitors busy, following up its washing machine and appliance business. Werry and Roller have an attractive, open shop, which takes advantage of a combination with a paint and wall paper establishment to occupy half of a double store.

Sunnyvale, which has come to be quite an industrial center, as well as the nucleus of a small farming district, boasts a new store, that of F. X. Bodin, who for some time has handled the contracting business of the community from his own workshop, but who has opened a progressive shop in town to take advantage of appliance sales as well as to serve as a headquarters for wiring and other business of that nature.

All this district itself is historically of the greatest interest. The Mission Santa Clara was founded about the time of the American Revolution and was considered one of the favored locations by the mission fathers, who well recognized the fertility and beauty of the valley. A little closer to San Jose, along the historic Alameda, whose trees were planted in the early part of last century, is the interesting home of the late Judge Rhodes, the timbers for which were brought around Cape Horn in 1850.

San Jose Stores

San Jose itself is served by a group of enterprising dealers, each with his specialty. The Garden City Electrical Company has recently doubled the size of its store. The company undertakes farm work as well as city business and keeps from 20 to 21 men in the field handling pumping installations as well as cannery work and home wiring.

The San Jose Electric Company has a distinctive store arrangement, with colorful windows which present a most attractive appearance. Jewelers' cases with polished shelves which reflect the bright appliances, a particularly well arranged lamp display, a chair and telephone at the disposal of customers, help to make the store pleasing to the visitor. The establishment specializes in city work.

One of the most attractive stores of the district is that of Wagner Brothers, who handle fixtures as their specialty, together with other electrical appliances, as well as andirons, fenders and other home needs. The distinctive feature of the store is the series of individual rooms, each tastefully decorated, where the fixtures are displayed in their natural setting.

The Century Electric Company, of which the late Frank Somers was the proprietor, takes advantage of a narrow space most effectively, utilizing high shelves which are reached by the ladders customarily used in shoe stores. A mezzanine floor with a repair shop upstairs in the rear, not only adds to the appearance of the interior, but gives a light place for the work and takes it out of the way. An electric sign down the front, as well as the familiar slogan, "Don't wurry," help to make this establishment a landmark of the community.

Among the other dealers of San Jose should be mentioned T. E. Baker and Sons, Inc., who occupy a most favorable location on the corner of Third and Santa Clara Streets, and who take good advantage of the window space thus offered, specializing in fixtures.

Progress of the Monterey Region

South along the highway from the Santa Clara Valley brings us next to the Monterey bay region, famous alike for its historic associations and its natural beauty. Monterey itself, of course, is known as the first capital of the state. Over the old customs house, which still stands, the American flag was raised for the first time in California. The Carmel Mission was the home mission of Junipero Serra himself and his grave is to be seen on one of the friendly hills of Monterey. Santa Cruz, Del Monte, and Carmel-by-the-Sea represent different phases of the summer life which takes advantage of the unusual picturesqueness of the coast line and the bracing summer climate. Aside from this more spectacular side of the district's life, a substantial farming and cattle industry is to be found throughout this region. Monterey itself is the center of an active fishing and fish-canning business, with its various related activities.

A most progressive spirit has been shown by the electrical dealers of this section. A new store is reported from Hollister, that of E. P. Greenep, who has added great improvements to a modern establishment. In Monterey the Noggle Electric Works have rearranged their store and added distinctive features to their merchandising service. J. A. Schanbacher of Watsonville has rearranged his store, with excellent results.

The Cox Electric Company of Santa Cruz have achieved interesting results in the careful arrangement of their store, while W. F. Blide, whose establishment, with that of the Cox Company, divides the service of the community, has moved to a new location and made effective changes in store arrangement and service.

All three dealers of Salinas have a record of recent improvements. The Posz Electric Shop is a new establishment

DOWN THE PENINSULA FROM SAN FRANCISCO

1. The Stanford Electric Company, one of the progressive stores which serve the college community at Palo Alto. 2. Werry and Roller of Palo Alto, who secure more open quarters by sharing a double store with a paint and wall paper establishment. 3. The "Palo Alto" (tall tree), which gives the name to the University town. 4. Watts Electric Company of Burlingame is located near a moving picture theater in attractive new quarters.

of a businesslike, well-arranged type. The Salinas Electric Works has doubled the size of its store and made notable changes in artistic arrangement. Anderson and Doyle specialize in farm plants and motor work and have enlarged their service to meet the active demand of the after-the-war period.

In the Vicinity of San Luis Obispo

Farther down the coast from the Monterey bay region is the prosperous agricultural district which centers about San Luis Obispo. Two new stores record the growth of this region, that of the Paso Robles Electric Shop of Pasa Robles and the Valley Electric Company of San Luis Obispo. The Electric Shop of the same city has enlarged the interior of its up-to-date establishment and made striking improvements in arrangement and equipment. Both electrical shops which serve Santa Maria, the Krelle Electric Company and H. J. Anderson, have rebuilt their stores and are giving unusual and effective service to the community.

Coast Districts

Farther down along the coast is the beautiful vacation and agricultural district which centers about Santa Barbara. Both electrical dealers of this pleasant city, the Nielson-Smith Electric Company and Fred A. Downer and Company,

SCENES OF ELECTRICAL INTEREST ABOUT SAN JOSE

1. A landmark of the early days of El Camino Real—the home of Judge Rhodes, timbers for which were brought around Cape Horn in 1850. 2. The hanging bell marks the highway all along its length. 3. The "Don't Wurry" slogan and an electric sign mark the front of the Century Electric Company. 4. T. E. Baker and Sons make good use of a corner frontage. 5. The well-planned interior of the San Jose Electric Company, and 6. A corner of its colorful window.

have moved to new quarters and fitted up their places of business with all modern equipment. Two new stores are reported from Ventura, the Phillips Electric Company and the Ventura Electric Company, both well designed and businesslike, and the establishment of John A. Behn has made several improvements in its stock arrangement and general service.

Los Angeles and Surroundings

The southern district of California is of course well known for its climatic and scenic beauty, as well as for the intensive development along horticultural and agricultural lines.

Los Angeles itself has some forty-two progressive electrical shops, among which twelve are new establishments, nine have recently moved to new locations nearer the center of business activity, and all give evidence of important improvements in equipment and service. Pasadena reports one new store and the remaining seven which were already established have greatly bettered their already up-to-date service.

The country in the vicinity of Los Angeles is similarly served. In Hollywood, the Hollywood Electric Shop has entirely rearranged its store along distinctive lines and the establishment of Thos. F. Marshall has adopted many modern improvements. The Jacobs Electric Company of South Pasadena have made comprehensive changes in recent months with striking results. Monrovia has an attractive new shop, that of H. N. Jackson, while H. P. Lingo, who has been serving the community, has made several progressive changes in advertising methods. T. W. Pemberton has opened The Electric Shop in Huntington Park with a carefully chosen stock, and in Inglewood R. D. Aylesworth has enlarged his store and moved into a better location.

Glendale has one interesting new electrical store, the Jewel Electric Company, while both the J. A. Newton Electric Company and the Glendale Electric Company of the same town have remodeled their business quarters to excellent effect. Among the new stores of this general locality are: Winder and Jones of Azusa (this is one of the series of attractive stores managed by this company), the Burbank Electric Shop of Burbank, the El Monte Electric Shop of El Monte, the Phillips Electric Company of Santa Paula, and an artistic store in Van Nuys opened by L. S. Granger. The Smith Plumbing and Electric Company of Van Nuys have also effectively rearranged and refinished their place of business. Several stores have found it possible to move to new quarters, generally nearer the business center of town, and in each case more spacious and modern. The Fillmore Electric Shop of Fillmore is one of these, while in Oxnard, J. L. Mitchell has moved his enterprising business to a new store with improved facilities. Wilson's Electric Shop of San Fernando, T. H. Armstrong of Santa Paula, and the Sierra Madre Electric Company of Sierra Madre are also among the progressive dealers who have bettered their location and working plant.

H. P. Gerckens of Puente has recently made tasteful changes in stock arrangement which have greatly improved the appearance of his store and the Gardena Electric Works of Gardena have undertaken a comprehensive revision of their equipment with excellent results. Among the notable progressive advances in this district which should be noted are the improvements recently instituted by William Coryell of Burbank, the La Verne Electric Company of La Verne, R. P. Farrell of Oxnard, R. E. Charles of San Fernando, all of whom have rearranged or added to their stocks and furnishings. Winder and Jones have also remodeled their branch in Glendora to most successful effect.

Progress in Orange County

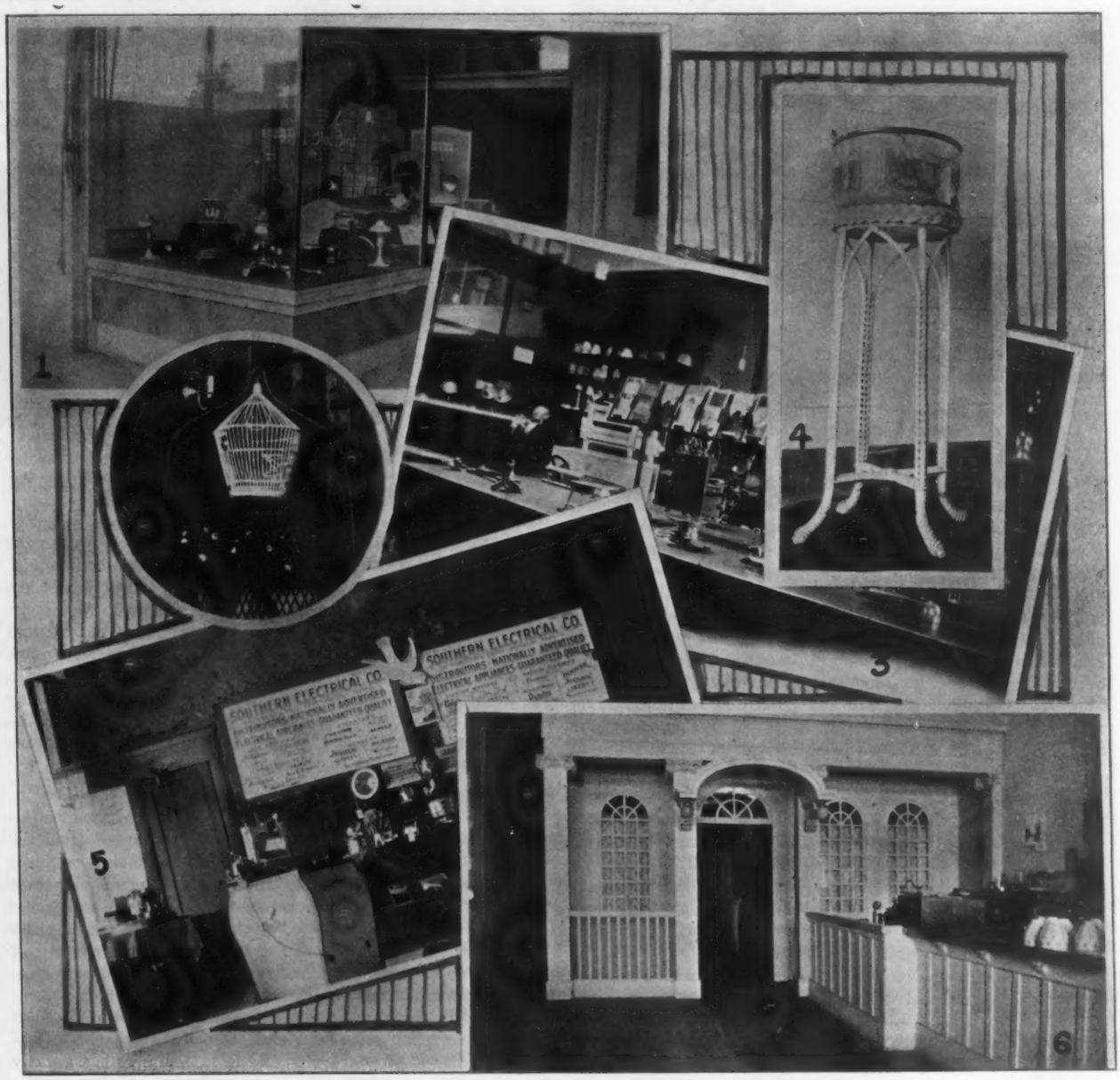
Just south of Los Angeles is a group of communities which center about Anaheim and which are most of them located in Orange county. This region is largely agricultural, but a group of oil fields also occurs here and a certain number of associated industries have grown up. Anaheim, which is one of the early Dutch settlements in California, is perhaps unique among the towns of the state in the record of new electrical shops which have been opened here within the last few months, all four of its distinctive stores having been established within this time. They are the Anaheim Electric Company, the F. A. Clarke Company, the Holland Electric Shop and the pleasant store of Joseph Lieb which has just been opened up. The Brea Electric Company of Brea also entered the field a few months ago and is giving modern

service in every respect. In Artesia, the shop of George Purviance has a record of numerous improvements.

Hall's Electric Shop in Downey has made minor improvements in several branches, and in Fullerton the Reid Farley Electric Company have completely remodeled and effectively reorganized their entire establishment. Moran and McWhinney of Hermosa have also tastefully remodeled their place of business to excellent effect. Orange itself now has two electrical retailers, of which the Orange Electric Company is a new establishment and the J. G. Robertson Electric Company has recently added numerous improvements which complete its up-to-date service. Four new stores have opened attractive quarters in Santa Ana—the Groninger Electric Service Company, the Granger Electric Company, the F. A. Clarke Company, associated with the other stores in the same territory under that name, and The Electric Shop. Both the Cope Electric Company and the J. G. Robertson Electric Company, which has a branch in this town, have enlarged their stores and remodeled the interior and furnishings. In Whittier the Stedman-Manson Electric Company have moved into a larger store and made various discriminating changes and C. L. Davis of the same community has modified his equipment and methods along many modern lines.

San Bernardino and the Orange Belt

San Bernardino is the nucleus of what is known as the Orange Belt, a region devoted to orange growing, as its name implies, but also containing great stretches of bean lands and general agricultural development. The dealers of this region are not behind the general prosperity of the district. San Bernardino itself is now served by four dealers, a new store having been opened within the last year by F. A. Clarke.



ATTRACTIVE STORES IN SOUTHERN CALIFORNIA

1. Window display of the Cope Electric Company, Santa Ana. The window is well designed to effectively display electrical appliances and it is always dressed attractively. 2. A fern and flower basket used by Snyder and Bell, San Bernardino, to add a touch of color to their artistic shop. 3. Advertising display rack of the Reynolds Electric Company, Santa Barbara. This rack is placed to advantage on a display table and metal post card racks are used to hold manufacturers' literature. 4. Fish bowl from the carefully designed interior of Snyder and Bell's electrical store in San Bernardino. 5. A display by the Southern California Electrical Company of San Diego in the office of the central station. 6. A front of the fixture display rooms of the Cope Electric Company, Santa Ana.

Both the Field Electric Company and Snyder and Bell of this city have remodeled their interesting establishments to good effect, and the Prest Electric Company reports minor changes of importance. Two other new establishments have recently opened in the Orange Belt, Hall and Bashore, with a well arranged shop in Covina, and F. A. Clarke Company in Riverside, a branch of the progressive new store in San Bernardino.

Winder and Jones have followed their enterprising custom in their Covina branch by moving into an attractive building in a better location. Clark's Electric Shop of Claremont has made numerous changes in the interest of improved service. In Colton, the Colton Electric Shop has tastefully rearranged its quarters and greatly improved the appearance of its attractive shop. Guy E. Ankrum of Hemet has also found it possible to better his location by moving into a new distinctive store. The Granger-Hall Electric Company of Ontario have maintained their same quarters, but have entirely refinished the interior and remodeled their windows with most satisfactory results.

Both electric stores of Pomona, the Harrison-Fitch Electric Company and the Pomona Fixture and Wiring Company, have made comprehensive improvements in equipment and methods, while in Redlands a similar record has been made. Of the two enterprising shops which serve this community, the Independent Electric Company have moved into a new store in a better part of town and the Southwest Electric Company have undertaken a complete modernization of their working plant. In this district there remain only to mention the Coldrens Electric Shop of Riverside, which has numerous innovations to its credit, and the Riverside Electric Company of the same city, which has brought its place of business to the front rank among merchants of the city by the recent changes effected in moving to new quarters in a more active location.

The Long Beach District

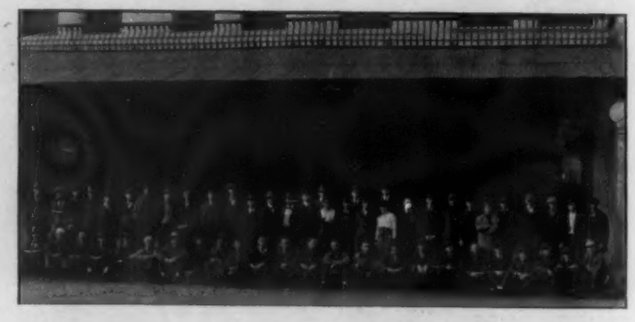
Long Beach forms the center of a coast district around which an interesting group of towns is located. Long Beach is the largest of these and here an active association of contractor-dealers serves the interests of the communities. Four new stores have grown up here within recent months, the American Electric Shop, the Long Beach Electric Company, the Acme Electric Company and the F. A. Clarke Company, who have also established a branch in this city. Of the older companies, both the Lane Electric Company and the Lantz Electric Company have remodeled and refinished their business quarters with modern and distinctive innovations. The Lewis Electric Company has instituted minor improvements to good effect and the Marsh Electric Company have moved nearer the active business district of town with enlarged facilities for up-to-the-minute service.

Ocean Park also reports extensive improvements in its electrical shops. The D. S. McEwan Electric Company have remodeled their store to a well designed plan and the Electric Shop has made minor changes in the interests of improved service. Similar improvement is reported by the establishment of Geo. S. Funk and Son of Redondo. San Pedro has two progressive stores, both of which have made striking improvements in recent months. These are the San Pedro Electric Company and Green's Electric Store, which has refurnished and remodeled its quarters. Santa Monica has one new store, Gould's Electric Company, which opened some months ago, and two other modern establishments, the Coast Electric and Machine Company and the Santa Monica Electric Shop, which report various minor changes along lines of effective merchandising. The Torrance Electric Shop has recently moved into a new building which gives larger scope to its businesslike service and both electric shops of Venice are distinctive and up-to-date. The Laseter and Billings Electric Company has recently opened an artistic shop, while the Coast Electric and Machine Company, a branch of the Santa Monica store of the same name, has remodeled its show windows and greatly improved the appearance of the business quarters.

Dealers of the Imperial Valley

The Imperial Valley is a distinct division by itself. It was perhaps first called to public attention some years ago when the Colorado river turned aside its course and flowed for a while into what is now the Salton Sea. The Spanish name for the place is La Palma de la Mano de Dios, "the Palm of God's Hand," a poetic reference to the fact that a great stretch of the valley's area is below the level of the sea. The great agricultural fertility of the soil under irrigation has led to intensive development within recent years and the valley is already famous for its canteloupes and cotton, as well as for dates and other tropical products. Of course, the commercial and mercantile activities of the valley have shared in the rapid growth and a group of progressive dealers now serves the needs of the district.

Brawley has two active electric shops, one of which has recently been opened by F. H. Myers, while the Akin Plumbing and Electric Shop, which has been established for some time, has moved into up-to-date quarters nearer the center of trade. Calexico also has one new store to its credit, the attractive Graham Electric Company. The Strawn Electric Company of the same town has transferred its headquarters to a better location where it is carrying on its efficient service. The Strawn Company also has a progressive branch in El Centro. The Southern Electric Company, of which C. H. Heilbronn is proprietor, is likewise represented in this city by a shop of that name which has recently opened artistic quarters, and C. F. Ferguson, of El Centro, has numerous notable improvements to his credit.



A FRESNO GROUP

The Valley Electrical Supply Company of Fresno, with its employes lined up in front of the store. Fresno has one of the progressive groups of electrical dealers which are typical of the central valley region.

San Diego Activities

San Diego is the most southerly of the important cities of the state, being located on the coast just across from the Mexican border. The climate is one of particular evenness and the scenic beauty of the surrounding region and coast line have made the place one familiar to vacationists and visitors from the East. The electrical dealers of this city are well equipped to give the up-to-date service required of them. Two of the stores have recently moved into new locations and modernized equipment—the Burton Electric Company and the Whenn Electric Company. The Hartwell Electric Company has remodeled and refinished its entire establishment with effective results, and R. L. Jennings has greatly improved the appearance of his place of business through the well-planned innovations which have recently been made. Various changes in the interest of progressive service are credited to the other dealers of town, C. F. Cunningham, the Independent Electric Company, the San Diego Gas and Elec-

tric Appliance Company, and the Southern Electrical Company. A second branch of the Southern Electrical Company has also been opened recently with well arranged quarters and stock.

The Valley Highway

El Camino Real itself really ends at San Diego, but a similar line of highways extends down the length of the Sacramento and San Joaquin valleys, the center of the state's prosperity. The two mountain ranges border either margin of the state, joining hands at Shasta on the north and Tehachapi on the south, leaving a great area which is some six hundred miles in length and a hundred and fifty miles across, and whose level is hardly broken even by slight undulations. The northern half of this plain is served by the Sacramento river and its various tributaries, while all the region south of San Francisco bay is dominated by the San Joaquin. The two rivers join just above San Francisco Bay and flow together through this drowned valley which was once their delta into the Pacific.

Sacramento Valley Dealers

The Sacramento Valley district comprises all this territory north of Sacramento. Its interests are those of general agriculture, with especial attention at the present time to the developing rice industry. The record of progress of the electrical dealers of this region has not been behind that of the agricultural. This was one of the latest sections to be included under the work of the California Electrical Cooperative Campaign, but it already has an active interorganization of its own and practically every dealer in the district has made improvements in the actual physical equipment of his establishment as well as in the adoption of up-to-date merchandising methods.

The John T. Morgan Company of Corning has opened a completely equipped electrical department with a comprehensive stock and a pleasant store arrangement. In Redding, the Shasta Electric Works have rebuilt the interior of their store and made notable improvements with effective results. Red Bluff boasts a new store recently opened by J. L. Thackeray.

A new store is also reported from Chico, that of J. W. Northedge, which is particularly attractive and well arranged. Both the other stores which serve this city have moved to new locations and greatly improved their equipment. W. S. Cass has a well stocked and tastefully designed establishment in a good neighborhood, while the Western Gas and Appliance Company has put in a fine new store with all modern improvements.

Similar progress is reported from Oroville, where the Electric and Auto Supply House has bettered its location and is now established in well arranged and up-to-date new quarters. A new shop has been opened by Doren Russell in Colusa and in Orland the Campbell Electric Company has effectively remodeled its quarters. Marysville now has three electrical dealers, all of whom have increased their business within recent months. Henry Berg has moved his shop to new quarters, the Geo. W. Roberts Company has added to its completely equipped and well planned electrical department, and T. Syversen and Son, who have recently joined the association, report good progress in both contracting and dealing departments. A. R. Hancock of Watsonville has moved his store to a better location and his many improvements in arrangement of stock and artistic setting have greatly added to the distinction of his shop.

An up-to-date new establishment has been opened in Roseville by R. K. Perry and the Holt Electric Shop has also been added to the group of contractor-dealers serving Woodland. Fred Weider's Electric Shop of that city is seeking new quarters with the idea of improving location and shop arrangement.

Sacramento and Stockton

Sacramento itself has one of the most progressive groups of dealers in the state and its electrical shops are both attractive in appearance and effective in service. One new store has been opened within recent months, the interesting establishment of the Sterling Electric Company, which is unique in the up-to-date ideas which have been worked out in its design. Two stores have moved to new locations better situated as regards the shopping district—The Electric Shop and the Sacramento Appliance Company—and each has made striking changes in arrangement and artistic stock display. The California Mechanical and Electrical Engineering Company, as well as the Electrical Supply Company and the J. C. Hobrecht Company, have remodeled the interior of their stores with most satisfactory and effective results.

Stockton is unique in the number of attractive establishments which serve it, seventeen dealers being listed in this group. Of these, six are new shops, recently opened: the Bright Spot Electric Company, the Eddie Electric Company, the Electric Utilities Company, the Electric Appliance Shop, the United Electric Store and the Washing Machine Store. Three dealers have moved to new quarters and made progressive modifications in stock arrangement and up-to-date merchandising methods. These are the Commercial Electric Company, Gould the Light Man and the Patzer Electric Shop. The Stanley Electric Company, who specialize in motor work, have greatly improved their working equipment.

Both Stockton and Sacramento are situated in the heart of the agricultural district and are the shipping centers for fruit, grain and general market products. Stockton, in particular, has developed an active industrial district and the electrical dealers of that region are called upon to supply the needs of flour mills, glass works, and like enterprises.

The Sierra District

The so-called Sierra district is next along the highway south from Stockton. This is in part a general agricultural district, but considerable attention is also devoted to the dairy industry. This was formerly the great cattle range of the Miller and Lux Company, which historical association perhaps accounts in part for the present activities along dairying lines. A sugar beet factory is located at Manteca and there is an investigation now under way in the hope of locating oil in this district. Six new stores are credited to this territory, as well as a group of active dealers already established who are continually improving their service.

In Oakdale, an attractive new establishment has been opened by A. C. Sipes. The Sullivan Electric Company of Modesto have also opened a fine new shop of unusual distinction and the Turner Hardware and Implement Company have added a complete and well-planned electrical department, under the management of C. C. Davis, formerly with the California Electrical Cooperative Campaign. The shop of J. M. Nightingale in the same community has been doubled in size to meet increased business, while Harrington and Lentz have made noteworthy improvements in stock arrangement and equipment.

Merced also claims an additional store which has recently been opened under the name of the E & S Installation Company, who have made unusual improvement in all branches of their work, and an additional shop has been opened in Madera, that of the Madera Electric Works, with an inclusive stock and well-designed appointments. Chas. Eyeman of the same town has also moved to a more favorable location and remodeled the interior arrangement of his shop to excellent effect. Another new store of the district is that of R. G. Murphy at Los Banos, a modern and effectively planned establishment.

Turlock is the center of a growing region, especially devoted to the raising of canteloupes and sweet potatoes, and

its electrical establishments reflect the progressiveness of the community. The C. E. Osborn Company here has reorganized its electrical department and made many improvements, and recently a new store has been opened by Roberts and Henderson which is modern in every detail.

The Mixer Electric Company of Lodi have recently rearranged their entire place of business, instituting many new features of a progressive nature, and a new establishment has been opened in Tracy, that of the Tracy Electric Works, which adequately serves that district.

The Center of the State

The Fresno district, a little farther south in the valley, is located in the exact geographical center of California. The region is one of unusual prosperity. It is the center of the fig and raisin industry and has developed besides its agricultural interests, an active group of industries directly associated with its agricultural resources, such as fruit packing houses, electrical refrigeration plants and factories devoted to the utilization of by-products.

The Valley Electrical Supply Company is the largest of the contractor-dealer establishments within Fresno itself and stands out as one of the most progressive stores in the entire state. They have recently rearranged the interior of their extensive quarters and have enlarged and remodeled the appliance department, which is one of the features to which they devote special attention. Each of the other dealers in town has greatly improved his establishment. The Electric Motor Shop and the Buford Electric Company, which specialize in motors and washing machines respectively, have each moved to new locations with much improved quarters. The Fresno Electric Company is also in a new home with modern and well arranged equipment. The Central State Electric Company has doubled the size of its store and is increasing its activities in outside sales work, while the Lewis Electric Company has rebuilt the entire interior of its shop with the most artistic results.

A modern new store has been opened in Selma by the Townsend Electric Company and the establishment of J. C. Limeburger in the same town has moved to an improved location and made many changes in the effective planning and arrangement of his store. In Dinuba the Dinuba Electric Company has made notable progress and in Hanford, O. F. Abbott has rebuilt the interior of his shop and added many attractive features in design and equipment.

Both electrical shops of Visalia have made numerous improvements. The Chaffee Electric Company has rearranged its quarters and opened a branch shop to care for its growing business, and the Visalia Electric Works has remodeled its store front and stock arrangement and completed the tasteful details of the shop interior. The E. M. M. Service Company of Lindsay has moved into fine new quarters where they occupy the entire building to themselves. The Central California Electric Company of the same community have reconstructed the interior of their place of business with most excellent effect.

A new store has been opened in Porterville, known as the Porterville Electric Works, with an adequate and well-chosen stock. A. R. Parsons, of Porterville, is also planning several progressive additions. In Coalinga E. B. Anderson has moved to a new location and achieved most pleasing results in the rearrangement of stock and store furnishings, and in Lemoore the new store which recently started as the Foley Electric Company is well planned and up-to-date. Tulare has two progressive establishments, the Crowe Hardware and Electrical Works, which specializes in motors, and R. E. Rounsaville and Company, who have recently bettered their location and fitted up new quarters in an attractive way.

Oil and Agriculture

The Kern district is located farthest south in the San Joaquin Valley and its special interests are those of agriculture and cattle raising, with most extensive oil development in the region of Bakersfield, where the several great oil fields of the state are located.

One interesting new store has been opened in Bakersfield— that of J. E. Baker—and the Star Electric Company, as well as the Kern Valley Electric Company, have both greatly improved their places of business. The Star Company has moved to a better location and has modernized its equipment throughout, while the Kern Valley Company has rebuilt the entire interior of the shop and instituted many other changes in the line of progress. R. S. Freels has built a new store in Delano which is well planned to meet the needs of the community and in Taft the Union Electric Company have rebuilt the front and interior of their store, adding many new features of interest. The McFarland Electric Works, of McFarland, have recently taken a progressive step by joining the state association.

The Work of the Cooperative Campaign

Thus the new Camino Real joins thriving modern communities, as the old shaded roadway brought together the picturesque but slow-moving settlements of the Spaniards. The list which has here been given of alert and prospering dealers is of course in no way complete, but it gives an idea of the wide-awake nature of the service along electrical retail lines which is not only answering but stimulating trade in all parts of the state, a satisfying condition which the California Electrical Cooperative Campaign has had an important part in bringing about.

A NEW MISSION AND AN OLD

The California Electrical Cooperative Campaign has a mission of helpfulness to the electrical retailing interests of the state which is bearing fruit in the wide-awake service which is being rendered the public up and down the length of the highway. Here is L. H. Newbert, chairman of the Advisory Committee of the Campaign, standing in front of the San Juan Capistrano Mission in company with Robert Sibley, editor of the Journal of Electricity, Frank Gray, and Henry Bostwick of the Pacific Gas & Electric Company.

THOMAS M. DEBEVOISE
Counsel
Electric Supply Jobbers' Ass'n
New York

T. E. BIBBINS
Pacific States Electric Co.
San Francisco

W. R. HERSTEIN
Electric Supply Co.
Memphis
Chairman, Central Division

A. M. LITTLE
Mohawk Elec'l Supply Co.
Syracuse
Chairman, Atlantic Division

DEL MONTE CONVENTION

OF THE

Electrical Supply Jobbers Association

G. W. JOHNSTON
Mid-West Electric Co.
Omaha

The special train of the Electrical Supply Jobbers from the East is due to arrive at Del Monte on the afternoon of Monday, May tenth. On arrival at the hotel the guests will have none of the usual worries with their baggage, on account of an original scheme worked out by the Hotel Transportation and Reception Committee. The special train will be met at Sacramento by members of the reception committee who will give each passenger a card showing the room that has been assigned to him, eliminating the necessity of each guest registering upon arrival at the hotel. On the train all baggage checks will be taken up by members of the committee and hand bags will be tagged with the name and room number of the guest so that shortly after arrival at the hotel all of the baggage will be delivered to the guest's room.

C. C. HILLIS
Electric Appliance Co.
San Francisco
Chairman, Pacific Division

W. S. BERRY
Western Electric Co.
San Francisco

F. M. BERNARDIN
B. R. Electric Co.
Kansas City

GEO. H. CURTIS
Sales Manager
Electric Ry. & Mfrs. Sup. Co.

E. W. ROCKAFELLOW
Western Electric Co.
New York

C. B. HALL
Illinois Electric Co.
Los Angeles

J. G. JOHANNESEN
Southern Electric Co.
Baltimore

P. STERN
Interstate Electric Co.
New Orleans

H. W. MATTHEWS
Matthews Elec. Supply Co.
Birmingham

H. J. GUNDLACH
Mine & Smelter Supply Co.
Denver

ALBERT H. ELLIOT
Sec'y, Pac. Coast Div., E. S. J. A.
San Francisco

C. W. HOBSON
Southwest General Elec. Co.
Dallas

C. T. McKINSTRY
Erner Electric Co.
Cleveland

D. E. HARRIS
Pacific States Electric Co.
San Francisco

TUESDAY, MAY ELEVENTH, will be spent in resting up from the trip, and excursions have been planned to the various points of interest around Del Monte. Doubtless a number of the guests will try out the golf links preparatory to the tournament which will form part of the sports program. In the evening Robert Sibley, editor of the Journal of Electricity, will give a talk on "The Vision of the West," which is a comprehensive survey of the present wonderful development in the electrical industry and of merchandising practice west of the Rocky Mountains. The lecture will be accompanied by a series of lantern slides and will be given in a non-technical style that will be of interest to the ladies as well as the members of the association.

F. H. STEWART
F. H. Stewart Electric Co.
Philadelphia

J. C. DAVIDSON
Hendrie & Bolthoff
Denver

WEDNESDAY, MAY TWELFTH. In the morning and evening the Divisions will meet separately in executive sessions for the transaction of such business as may be brought before them. The afternoon will be devoted to sports and the members will spend the time getting into par form for the golf and tennis tournaments which start the next day. All entries for these tournaments must be in the hands of the committee before 5 p.m. During the evening a '49 camp will be conducted in the billiard room. This camp will be a vivid and realistic reproduction of one of the mining camps of the West as it existed in "the days of old, in the days of gold, in the days of '49," and an interesting time is promised to all, especially to the visitors from the East who have never seen anything of the sort.

W. E. ROBERTSON
Robertson-Cateract Electric Co.
Buffalo

H. C. LUCAS
Philadelphia Electric Co.
Philadelphia

H. D. RANDALL
Capital Electric Co.
Salt Lake City

JAMES CLARK, JR.
James Clark Jr. Electric Co.
Louisville

G. S. SMITH
J. F. Buchanan & Co.
Philadelphia

SAMUEL H. TAYLOR
Electric Ry. & Mfrs. Sup. Co.
San Francisco

N. G. HARVEY
Illinois Electric Co.
Chicago

B. B. DOWNS
St. Paul Electric Co.
St. Paul

F. N. AVERILL
Fobes Supply Co.
Portland

J. J. COOPER
Mountain Electric Co.
Denver

THURSDAY, MAY THIRTEENTH. At 10 a.m. there will be a meeting of all of the Sections in general convention and John A. Britton will address the meeting on the "California Electrical Cooperative Campaign," giving the central stations point of view. During the meetings of the general convention on Thursday and Friday mornings the California Electrical Cooperative Campaign will be discussed by the Association which will be addressed by Lee H. Newbert, chairman of the Advisory Committee of the Campaign, D. E. Harris, of the Advisory Committee, and Clyde H. Chamblin, president of the California State Association of Contractors and Dealers. The tennis tournament is scheduled to start at 9 a.m. and the Kickers Handicap Medal Play of the golf tournament will take up the afternoon, which has been set aside for sports. In the evening Albert H. Elliot, secretary of the Pacific Division of the Association, will address the members on "California and the Association."

G. W. PROVOST
Union Electric Co.
Pittsburgh

ANDREW CARRIGAN
Dunham-Carrigan & Hayden
San Francisco

FRIDAY, MAY FOURTEENTH. Nine-thirty a.m. has been set for the opening hour of the general session which will take up the morning. In the afternoon will be held the final play in the men's singles and the woman's singles in the tennis tournament, and the woman's putting contest and the Medal Play, which is open to both men and women in the golf tournament. In the evening a brief business meeting will be held which will be followed by the Ball. During the ball the winners of the various plays and tournaments will be announced and the prizes will be awarded. These prizes have been contributed by the jobbers and manufacturers of the Pacific Coast.

H. L. WALKER
Henry L. Walker Co.
Detroit

F. E. BLAKE
Hawaiian Electric Co.
Honolulu

O. B. STUBBS
Stubbs Electric Co.
Portland

W. W. LOW
Electric Appliance Co.
Chicago

F. S. HARDY
F. S. Hardy & Co.
Boston

Electrical Supply Jobbing Business in the West

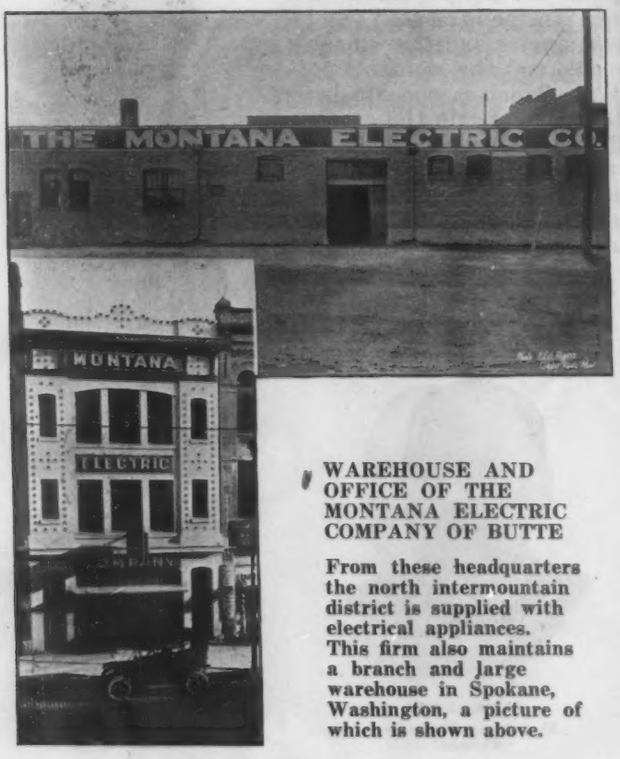
(The West has ever been noted for its merchandising methods. Here is a brief resume of the principal jobbing houses that have made this section of our nation such a strong contributor to ideals of service and cooperation that today make the electrical industry in the West stand out as pre-eminent in sections of the country so far as institutions of this nature are concerned. —The Editor.)

The five states of California, Oregon, Washington, Montana and Utah, and one territory—Hawaii—are included in the Pacific Division of the Electrical Supply Jobbers Association, a vast territory stretching from the snow-covered Rockies to the tropical

THE WASHINGTON ELECTRIC COMPANY

Office and warehouse of the Washington Electric Supply Company, Spokane. This is a branch of the Montana Electric Company of Butte and handles the business of that firm west of the Cascade mountains.

isles of the mid-Pacific, and from the Douglas firs on the Canadian shores of Puget Sound to the cactus of the Mexican deserts.



WAREHOUSE AND OFFICE OF THE MONTANA ELECTRIC COMPANY OF BUTTE

From these headquarters the north intermountain district is supplied with electrical appliances. This firm also maintains a branch and large warehouse in Spokane, Washington, a picture of which is shown above.

The Capital Electric Company of Salt Lake City also maintains a branch in Butte, Montana, under the name of the Butte Electrical Supply Company, and cover the territory of Utah, Idaho, Nevada, Wyoming and Montana. A house organ known as the "Generator" is published monthly and acts as an accessory salesman, being mailed to all of the dealers, central stations and industrial plants in their territory. Mr. H. D. Randall is manager.

The Intermountain Electric Company of Salt Lake City have an up-to-date establishment and also cover the inter-mountain territory, with C. B. Hawley as its active head.

The Montana Electric Company in Butte handle the north inter-mountain territory and maintain a large warehouse in Great Falls and a branch establishment in Spokane, Washington, under the name of the Washington Electric Supply Company. H. W. Turner is president with H. L. Bargion as manager.

SHOW WINDOW OF STUBBS ELECTRIC COMPANY

This effective display of lamps and appliances in the windows of this up-to-date Portland jobber has played a large part in the building up of his business. The Stubbs Electric Company firmly believes that windows should be ornamental as well as useful.

The North Coast Electric Company of Seattle, with its branches in Tacoma, Washington and Portland, Oregon, covers the Puget Sound district. Harry Byrne is manager.

The Fobes Supply Company maintains large warehouses in both Portland and Seattle and is the oldest electrical supply jobber in the Northwest, having been established since the late nineties. F. N. Averill is manager at Portland and Phil Aaron is manager at Seattle.

In the Stubbs Electric Company, Portland has a live jobber with Mr. O. B. Stubbs directing the activities of the company.

Marshall-Wells Company have their main office in Portland with a branch in Spokane to look after their interests east of the Cascades.

The Hawaiian Electric Company, Ltd., of Honolulu, cover the mid-Pacific area which includes all of the islands of the Hawaiian archipelago that are served with electricity. Frank Blake is manager.

The Illinois Electric Company of Los Angeles is a branch of the Chicago company of the same name and has been established in the southern part of California since 1902. C. B. Hall is the active head.

The Graham-Reynolds Electric Company, which operates in the city of Los Angeles and the territory south of the Tehachapi Pass, has a thriving business and is using the latest methods of approved salesmanship. Newt Graham is the manager.

Listenwalter and Gough, Inc., have a modern establishment in Los Angeles that is holding its own and getting its share of the business in that territory.

The Gilson Electric Supply Company of Oakland cover the east bay territory satisfactorily with a live establishment.

The Pacific States Electric Company, which has branches in San Francisco, Seattle, Spokane, Tacoma, Portland, Oakland and Los Angeles, also maintains warehouses in San Francisco, Seattle, Portland and

GRAHAM-REYNOLDS COMPANY'S ESTABLISHMENT LOS ANGELES
This modern two-story building is the home office of Graham-Reynolds Company and from here the highly effective selling force of the company are directed in covering the territory south of the Tehachapi.

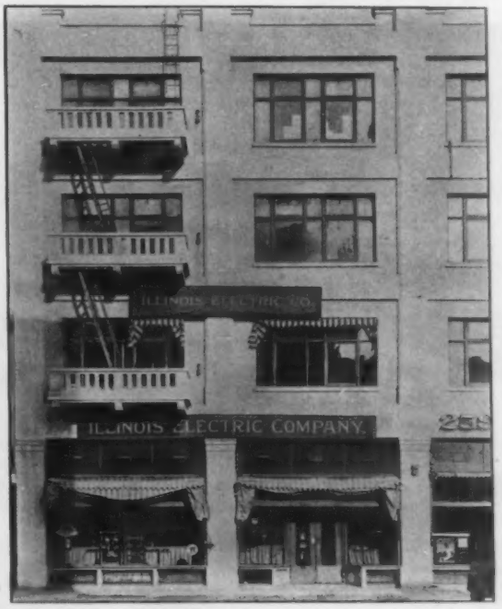
Los Angeles. This company was incorporated in 1909. T. E. Bibbins is president, with D. E. Harris vice-president and salesmanager.

The Electric Railway and Manufacturers Supply Company is the oldest jobbing firm in San Francisco and on the Pacific Coast. It was incorporated in 1898 and handled principally insulating material and overhead line material. Since that time the specialty of the company has been insulating material and it has been a pioneer in this branch of the industry in the United States. Samuel H. Taylor is general manager.

The Holabird Electric Company, with its main office in San Francisco, has a branch office in Oakland. R. D. Holabird is general manager.

The Alexander and Lavenson Electric Supply Company of San Francisco is one of the younger jobbing houses of the bay region, whose business is growing rapidly.

Dunham-Carrigan and Hayden entered the electrical jobbing field in conjunction with a wholesale hardware business. Mr. C. E. Wiggin is in charge of its electrical department.



EXTERIOR OF ILLINOIS ELECTRIC COMPANY, LOS ANGELES
This thriving branch of the Illinois Electric Company of Chicago, under the able management of C. B. Hall, has been active in the electrical jobbing business in Southern California since the early part of this century.

The Electric Appliance Company, which was incorporated in San Francisco in 1904, is closely

ERMSCO BUILDING IN SAN FRANCISCO
Mr. Samuel H. Taylor, general manager of the Electric Railway and Manufacturers' Supply Company, and incidentally the "daddy" of the electric supply jobbers on the Pacific Coast, holds forth here. From his office come words of wisdom, the result of long experience in the game.

INTERIOR OF THE ELECTRICAL APPLIANCE COMPANY'S OFFICE
This modern San Francisco office, which was specially designed for an electrical jobber, has all of the advantages of proper lighting and showcase room to properly display the goods carried in stock.

EXTERIOR—ELECTRIC APPLIANCE COMPANY
After the San Francisco fire of 1906 the Electric Appliance Company decided to erect a modern building that would be a credit to the company and a modern establishment for an electrical supply jobber, with the above result.

affiliated with the Electric Appliance Companies of Chicago, Dallas and New Orleans, and cover the states of Arizona, Oregon, Nevada and California. C. C. Hillis is general manager.

The Western Electric Company maintains jobbing houses in San Francisco, Los Angeles, Portland, Seattle and Salt Lake City. W. S. Berry, with headquarters in San Francisco, is in charge of Pacific Coast sales.

These are typical jobbers of the West, and all of them have the true vision of the West, which is really nothing but the idea of the hardy pioneer brought up to date. Instead of braving the perils of the desert and the dangers of the unknown trails over the mountains, these men have looked forward to the day when the West would be a group of true electrical homes and when the Pacific Coast would be outlined by a transmission line stretching from Canada to Mexico. With this vision held before them these men have striven toward that end, formulating a policy based on the Golden Rule and "live and let live." This vision is now fast becoming a reality and the jobbers, true to their ideals, are looking still farther ahead and planning a bigger vision that will not have any geographical boundaries, but will strive to carry the big mission to the rest of the men of the trade through the Electrical Supply Jobbers Association.

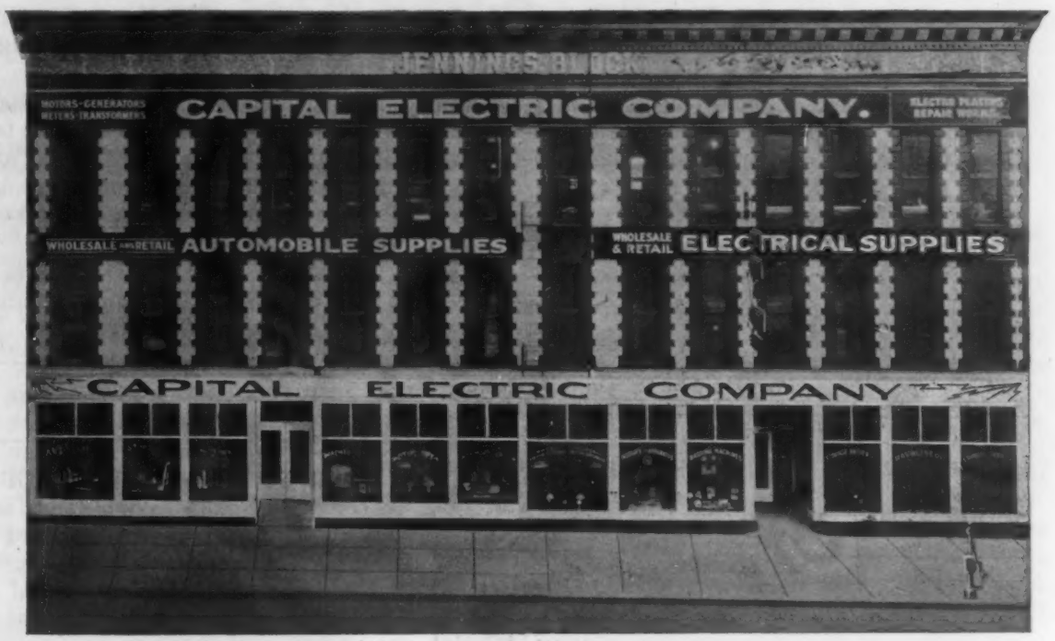
PACIFIC STATES ELECTRIC COMPANY BRANCHES

Upper left: Seattle Office
Upper center: San Francisco Office
Upper right: Los Angeles Office
Lower left: Portland Office
Lower right: Oakland Office

Besides the offices shown, the Pacific States Electric Company has branches in Spokane and Tacoma and large warehouses in Seattle, Portland, San Francisco and Los Angeles. This chain of stores covering the entire Pacific Coast insures the customers of the Pacific States Electric Company the best possible service.

CAPITAL ELECTRIC COMPANY OF SALT LAKE CITY

One of the few electrical jobbing firms to publish a house organ is the Capital Electric Company which puts out each month "The Generator," distributing it to the central stations, dealers and industrial plants in its territory. This territory embraces the intermountain district. The company maintains a branch in Butte, Montana, under the name of the Butte Electrical Supply Company.


CAPITAL ELECTRIC COMPANY.
WHOLESALE AND RETAIL AUTOMOBILE SUPPLIES
WHOLESALE & RETAIL ELECTRICAL SUPPLIES
CAPITAL ELECTRIC COMPANY

Office Records—Their Filing and Indexing

BY IRENE WARREN

(Filed material is constantly being needed for reference, and the fact that it is consulted and borrowed by various individuals and departments in the organization necessitates a strict system of charging, similar to that used in libraries. This point is taken up in the following article, the eighth of the series, by the director of the Chicago School of Filing and Indexing. —The Editor.)

THE USE OF THE FILES

Most firms keep letters, invoices, bills, and other records from three to ten years. The occasional reference to the old files is extremely important, but of far greater importance is the current use of the files and all systems should be planned with this in view.

The competent file clerk aims to get every paper into the files as quickly as possible and to keep all papers there that are not in actual use, so that any one needing information from the files may get it quickly.

Regulations

There are three distinct types of questions brought to the filing department: the request for (1) a paper needed in verifying a point which takes but a moment's time, (2) a paper which needs to be studied somewhat longer—five to ten minutes, possibly, and (3) a paper which must be taken back to the borrower's department and kept for considerable time, perhaps a week.

The loan desk or charging desk in the filing department is placed opposite the entrance, and if there are many references to the files, one or more persons are assigned the duties of loan desk attendants. A small table is also placed near the door for those who wish to consult papers for a short time. A railing separates the borrowers from the filing cabinets. It is never advisable to let them get papers out.

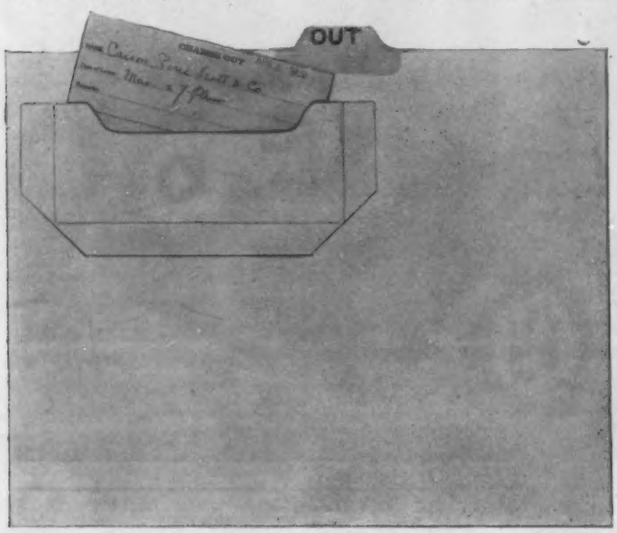
Every filing department should have regulations for the users of the files so as to avoid misunderstandings. The following regulations are in use in a large manufacturing plant:

REGULATIONS FOR THOSE USING FILES

1. No one not an employe of the Filing Department may have direct access to the files during regular working hours, 8:30-5. After closing hours, any papers drawn out are to be placed in baskets provided for this purpose on the charge desk. No papers are to be replaced in the files.
2. All requisitions for material on file must be specified in writing on blanks provided for that purpose. Each department has been given such blanks.
3. Correspondence charged to one person may not be transferred to another except through the Filing Department.
4. File clerks shall not be responsible for delivering or "running down" material not on file within the department.
5. Collections of material to be filed from the various departments will be made at 9:00 and 11:00 a.m. and at 2:30 and 4:00 p.m. Messengers from Filing Department will call and as far as advisable, all miscellaneous deliveries shall be avoided. (Time of collections will be changed if other hours are found more convenient.)
6. Material collected from each department will be kept in separate containers until inspected, and if any article lacks stamp or number, or for any other reason should not be ready for filing, said article will be returned to the department from which it came for addition or revision.
7. Any correspondence or original orders received in the Filing Department pinned together will be pasted together at the upper left hand corner. If this is not satisfactory for certain correspondence or orders, please so state, and give reason for **not** pasting when sending in material. (Pins take up too much room in the file and their use is to be avoided whenever possible.)
8. It shall be the aim of the Filing Department to give, at all times, the most efficient and courteous service it is possible for human agents to render, and we ask the cooperation of all departments that we may attain this end.

Charging Methods

The best method for charging papers is to use an Out-guide with a pocket at the top into which the charge slip is placed. The Out-guide may be used over and over again. It is placed in the file exactly where the papers are removed. The three-by-five-



Specimen of the Out-guide used as a record of material borrowed from the files. The charge slip is placed in the pocket at the top of the guide.

inch slips are made into pads and kept in each department. The borrower fills in as much as he can, signs the slip, and the file clerk completes the charge. The information given on the charge slip must be arranged in accordance with the system used. For an alphabetic name file the following plan is used.

(1) **Description of item.**
1. Letters, bills, invoices (check item wanted).
2. Name of writer or customer.
3. Subject of letter (give in one or two words).
4. Date of letter.

(2) **Description of borrower.**
5. Borrower's name.
6. Borrower's department.

(3) **Transaction.**
7. Date borrowed (on upper right hand corner of slip).
8. Date renewed.
9. Date for return.

It is a good plan to paste or pin to each item used a bright colored slip bearing the following instructions:

NOTICE

This correspondence is charged to your department and must be returned to the files promptly. Under no circumstances are these papers to be transferred to any other department except through the file-room.

Checking Up Borrowed Material

Every day or every few days, as seems advisable, the file clerk lists those papers not returned on time and notifies the borrowers by phone or on a memo designed for that purpose. It is customary to renew papers for the same length of time as the original loan. The return slips are counted each day and statistics kept which are valuable in showing the growth of the department. The whole plan of lending business papers from the filing department is very similar to the plan of lending books to patrons of the public library.

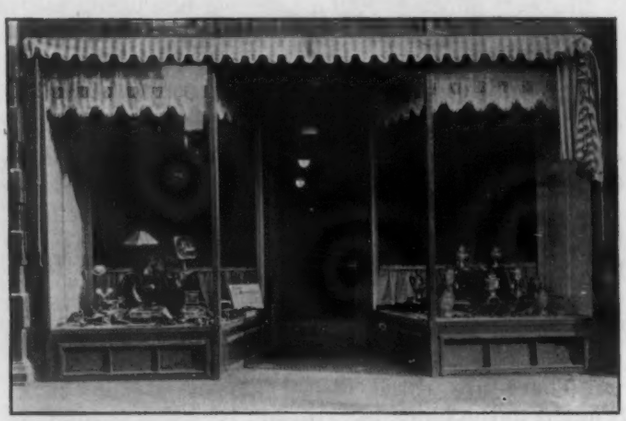
Frequently employers say they are too busy to wait to have material they want to borrow charged. But these are the concerns that allow high salaried men to wait hours and sometimes days for the papers they need, and when papers are lost, invent the best answer they can to the inquiry.

Many filing departments have hundreds of calls a day for papers. The aim is to answer each request promptly and courteously.

Western Ideas

WINDOW DISPLAY PICTURES are estimated by some to be more valuable than any other publicity factor. The window display is indeed the shop's one tangible introduction to the public. Here every passer-by sees exactly the type of goods handled by the shop and further gets a visual impression of the way in which it is handled. Since the window, above all else, expresses the personality of the store it should certainly be capitalized in every way. Most effective of all has been found the well-taken picture which can be used as an advertisement in the daily papers, in shop booklets or on posters.

Further, no dealer should consent to presenting any but the best picture of his window to the public. If he is wise he will hire a professional commercial



The window display of the Sterling Electric Company of Sacramento, California, which shows how a pleasing effect may be obtained at little expense if good taste is used in arrangement. The desirability of displaying the merchandise on different levels can be seen. In this way a spacious effect is obtained even though the window contains a large number of articles. The small curtain across the back of the window is a simple yet artistic way of setting off the window from the rest of the shop.

photographer for the purpose whenever possible, and will make sure that the rest of the store is made dark so that the window will stand out by itself. Night time is therefore the best time for taking the picture. Progressive dealers have found that additional customers come to their shop because of extensive publicity of their effective window displays, and so have decided that every effort should be expended in improving their arrangement and lighting, and in making them as varied and interesting as possible.

The Commercial Instinct

BY S. M. KENNEDY

(The constructive imagination which creates opportunities is one of the most invaluable business assets. The general agent of the Southern California Edison Company here analyzes what he calls the "commercial instinct" pointing out the unlimited opportunities which lie open to the resourceful electrical salesman. This is the eleventh article of Mr. Kennedy's series.—The Editor.)

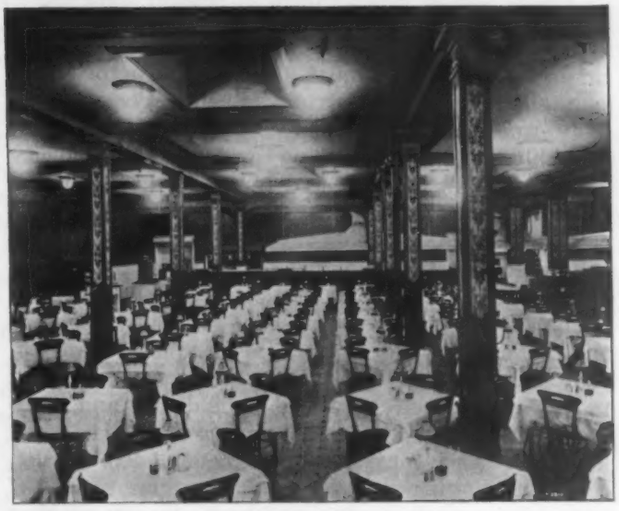
While there is little resemblance between a central station business and that of a mercantile establishment, yet, in the development and up-building of each business the services of a certain class of men become necessary. In the central station business, skilled electrical and mechanical engineers are required to design and construct the plants, and plan and erect transmission and distribution lines—but as a rule, these same engineers know little about marketing the product and selling the service of the central station. The work falls upon the commercial engineer, the sales engineer, the plain salesman or whatever he may be termed—but at any rate, he

Special lighting for the large steam table of a cafeteria. It should be the aim of the salesman of electrical energy to build up as many types of load for his company as possible so that the central station may operate continually at the highest efficiency.

must be a man who has commercial training with an instinct for finding busniess, and the sagacity to secure it. Some men innately have the commercial instinct. In some men it may be developed, and with others neither education or exhortation, neither precept nor example will ever make them realize how to see and how to sell. While it may be true that it is impossible to develop this commercial instinct in some men, it may also be true that other men may be born with an abnormal amount of it. An instance of this may be found in the story of a man who one day rushed into a store and said to the clerk, "Quick, a quarter's worth of carbolic acid!" "This is a hardware store, not a drug store," explained the quick-witted salesman, "but we have a fine line of ropes, revolvers and razors." Again it is possible where in some instances the commercial instinct is developed, that there may be some over-development, along calm and deliberate lines. A certain printing and engraving establishment in Buffalo one day received a notice from one of its customers in the banking business in a middle west town, containing the information that its president had died. The notice was turned over to a clerk with instructions to send a suitable reply. In due course the bank received a letter from the Buffalo establishment which read as follows: "We are greatly pained to learn of the loss sustained by your bank, and extend to you our heartfelt sympathy. We notice that the circular you sent us, announcing Mr. Brown's death, was lithographed by a Chicago house. We regret that you did not allow us to figure on this job. The next time there is a bereavement in your bank, we shall be glad to quote you on lithographed circulars, and feel confident that we can give you better work at less cost than any other house in the business. Trusting we may soon have an opportunity to quote you prices, we remain, with profound sympathy,—" This man's idea of taking advantage of every opportunity may have been carried a little too far, but he certainly had the commercial instinct fully developed.

Cumulative Results

The manager of a utility company knows that the fundamental basis for selling his product is to get the public confidence. The confidence must be



Interior lighting of a new restaurant. In theatres and hotels and all places where decorative lighting is a special feature, exceptional opportunities are offered to the electrical salesman.

mutual between buyer and seller; after that it is only a question of merit—that is, the value of the commodity offered and the ability of the salesman to convince the buyer that he should place an order.

In the central station business, the salesman has a wonderful story to tell to the prospects for service. There is a great difference between the results obtained by the salesman for a mercantile establishment and those obtained by the man who sells electric service. For the merchant, when a sale is made, and the money for the goods purchased is paid over, the transaction is closed. But for the electric company the sale of service, be it light, heat or power. the sale of a lamp, a motor or a current-consuming appliance is just the beginning of business—for month after month and year after year, the current-consuming device or its successor, be it lamp, motor or appliance, will continue to produce an income for the company. Consequently, the electrical salesman's work cannot be measured by the day, for it is cumulative, and the results go on forever.

Visualizing Business

The electrical salesman, with the commercial instinct, sees opportunities for business in every direction. To the merchant he points out the advantages of electric light for displaying his goods, for keeping his ceilings and store clean, by an absence of smoke and smut; for reducing the heat in summer, and permitting good air at all times; for improving the decoration of his windows, and keeping them attractive, winter and summer, so that the pubic may see what he wishes to display. And then the salesman shows the merchant a score of electrical devices which may be operated to advantage inside his store, to lighten the work of his employes and help him make money. Finally the salesman takes his merchant friend to the door, and points out the location where an electric sign will work for him while he sleeps; how he can burn his name and business into the public mind—and how the electric company will take care of the sign, turn the current on and off at the proper times and relieve him of all responsibility in the matter. The power user has much to learn and to a great extent the salesman with the commercial instinct must be his instructor. The salesman drops into a factory, in connection with his daily work of spreading the gospel of electricty. Probably this factory is in a crowded part of the city where space is valuable and rents are high. What does he see in connection with the operation of the private plant? Probably fifty per cent of the power generated, wasted and dissipated in shafting and belting before the machines commence to operate. Probably ten times as much space given up to engines and boilers, as would hold a complete electrical equipment. Probably twice as much money invested in the power end as there should be, and, consequently, twice as much interest, taxes and insurance and four times as much depreciation continually piling up. He probably finds plenty of noise, dirt, smell and inconvenience, to say nothing of high priced skilled labor to keep the decrepit wheels of his private plant moving. Little by little —by explanation and by exhibition, the salesman can show that electrically driven machinery represents economy of power, by means of direct connected units; that motors occupy little space and may be taken off the floors and stuck on the walls and ceilings; that they cost half the price of other kinds of power equipment; that their maintenance and depreciation is a matter of little consideration; and finally, that they are clean, noiseless, convenient and reliable, and do not require skilled labor to operate them. To the manufacturer who has had constant worry keeping his plant going and his factory running, this story sounds like sweet music in his ears, and the skilled salesman sooner or later gets the order he is after.

Transforming a Home

When the electrical man with the commercial instinct has an opportunity to turn himself loose in the modern home he speaks with the tongues of men and angels. At every turn he can make a suggestion that will help the customer and benefit his company. There is some electrical device for every room which will lighten labor and ease the strain of daily life. The kitchen has many electric cooking appliances, and other devices for cleaning, polishing and dishwashing. The laundry has the electric washing machine and electric irons, mangles and dryers. The dining room has electric table accessories such as toasters, percolators, tea-urns and chafing dishes; the living room has eye saving electric reading lamps, fans, foot warmers, cigar lighters and motors on the piano and organ. The bedroom has electric heating pads, water bottles and water heaters. The bath room has electric shaving mugs and curling irons—while the work of the vacuum cleaner and other sanitary appliances is in evidence in every direction. In all his work the man with the commercial instinct in selling electric service has no more convincing argument than that of saving time. Electric service saves time, and to save time is to lengthen life. In this age of hurry, time is one of the most valuable assets of the business man and the women in the home, and a proposition that will save time is one that will invariably receive careful and eager attention.

Diversity of Load

To the man with the commercial instinct, the electric company looks for the up-building of the load factor as well as the load. It is an easy matter to explain the difference between load building and load factor building, but not always easy to tell how to obtain a better load factor when building up the business of a central station company. In most communities evening peak will come without much effort, but not so with day load and early morning load. In order to build up a really good load factor, there must be a great diversity in the classes of service supplied, and for an electric company to attain a really high load factor there must be a great diversity in load, or else relatively large blocks of power must be sold for continuous use. The man with the commercial instinct knows of no class of business that would not be better for using electric service, and by getting all classes into line, and selling the limit each class can consume, he obtains the needed diversity of load and builds up the load factor on his company's system. This can be done only by extensive and intensive development, mainly brought about through the personal efforts of the man with

the commercial instinct, in constantly explaining and demonstrating the undeniable advantages derived from the use of electric service—"To every man according to his necessity—for every man according to his need."

Creating Opportunities

The problem for the central station manager is to develop the commercial instinct in all departments of his organization, and not look for it alone in his new business department or among his salesmen. There is no kind of business that is as susceptible of development through suggestion as that of the electric distributing company The clerk at the counter receiving an application for service can inquire if the applicant has this appliance or the other and point out where it may be seen and purchased. The cashier or his assistants may easily suggest that the customers making payments look at some new electrical device which may be on exhibition in the office display room. The man who comes in to make a complaint, if properly handled, may go away with a determination to buy some other current consuming apparatus just because its advantages were carefully explained by the clerk who received his complaint. The collector has a splendid opportunity for he talks to scores of customers daily. The trouble man who goes into the home to make repairs has a rich field in which to sow the seed that arouses interest, and develops inquiries for greater service. There are no limits to where suggestions may be made for there is no consumer using so much service that he cannot take some more to his own advantage.

The Personal Element

The man with the commercial instinct fully developed usually knows the value of attention to his personal appearance, and how much depends upon the impression his appearance makes when calling upon prospects. In the central station business, a man representing an important company has a great responsibility for the magnitude and importance of his company is often measured by the appearance of the representative. The man with careless apparel and unshaven face always places himself at a disadvantage, and, of necessity, the company he represents also. The world rarely puts a higher price upon a man than he places upon himself, and frequently it marks him down from his own estimate. Carelessness, untidiness, and disregard for the conventionalities have relegated many a man to the bargain counter. There are only two kinds of men who can afford to disregard their personal appearance—the very rich man and those without ambition. However, if either of these classes get into the central station business and remain untidy, their careers in that industry would necessarily be short. The successful commercial man also knows the value of courtesy and enthusiasm—in reality it is the greatest factor in his success. With his enthusiasm he will at all times work to convince the people that his company is operating in their interest—and will do everything possible to render the business relations between the company and its patrons, pleasant, agreeable and profitable to both. The more people the commercial man can get to think favorably of him and his business, the faster will the business develop and increase. Then, mixed with courtesy and enthusiasm, there is a tremendous asset in a pleasant smile, and the man behind the pleasant smile has a tremendous advantage—

> "The thing that goes the farthest towards making life worth while,
> That costs the least and does the most, is just a pleasant smile.
> It's full of worth and goodness too, with hearty kindness blent,
> It's worth a million dollars, and—it doesn't cost a cent."

Recognizing Friends

The central station man with the commercial instinct has one friend for whom he has the highest regard—that is the customer. There are some men in the industry who seem to think the central station business would be simply irresistible, if it were not for the customer. Such men look upon an applicant for service as an objectionable nuisance; a request for information about some electrical appliance as simply a bore, and a desire to pay an electric bill something that should be barely tolerated. Such men, however, are being gradually eliminated, either by the process known as "the survival of the fittest" or by assasination at the hands of irate customers. But the man with the commercial instinct knows that the customer is the best friend he has. This friend patiently listens to wonderful tales of a light that is more fascinating than that which gleamed from Aladdin's lamp—of the marvelous, health-inducing and sanitary heat, and of the mysterious power, which works quietly and effectually in daylight and darkness. This friend signs all applications for various kinds of service as they are presented to him, orders all sorts of current-consuming devices and appliances to increase his consumption, sits up nights to use more freely the commodity supplied, and at the end of the month, insists upon paying good money for the most intangible product ever sold or distributed. The man with the commercial instinct recognizes that customer as the one thing needful to him and the company, and that the customer should always be treated with such courtesy, deference and tactful politeness that he will think and believe doing business with him and the company he represents a real pleasure.

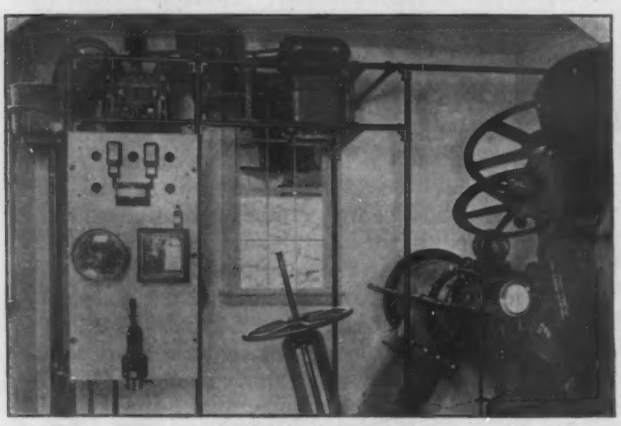
To the engineer, is is a great source of satisfaction to have the honor of aiding substantially in the construction of some immense power plant that harnesses and tames a mountain torrent and delivers its energy in a commercial form in some center of population, maybe a hundred or miles away. But the satisfaction and pride of the engineer is not greater than that of the man with the commercial instinct who goes out and finds a market for that power. Through his untiring efforts it is advantageously used every hour in the day, thus producing earnings which justify the investment represented in the installation. At the same time, cheerfulness, health, hope and happiness are brought to the many who have been persuaded to accept the magic service of the electric company through whose foresight and enterprise such service has been made possible.

Remotely Controlled Hydroelectric Synchronous Generators

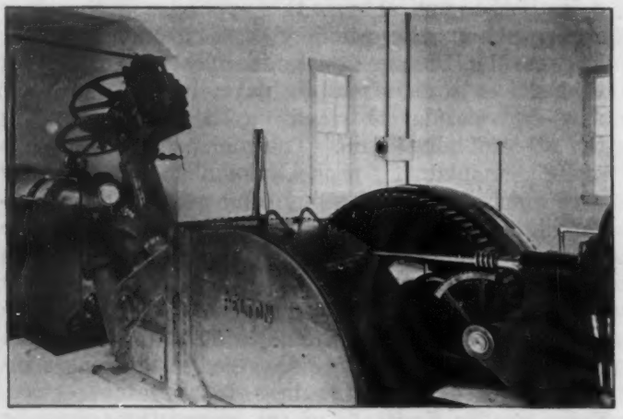
BY CHARLES H. TALLANT

(Typical of present day development of hydroelectric installation on the Pacific Coast, is that of the automatic installation at Ontario, California, by the Ontario Power Company. This is the second of its kind to be installed in the world, and, as a consequence, commands unusual interest at the present time.—The Editor.)

Semi-automatic hydroelectric induction generator plants and remotely controlled induction generator plants, while not in general use, have been given frequent consideration. It remained for the Ontario Power Company, California, however, to install a remotely controlled synchronous generator hydro plant as a very new idea in central station practice.



Partial view of the motor operated needle valve and view of the main panel mounting the line switch and meters.



Interior of remotely-controlled hydroelectric generating station, showing generator, water-wheel and limit switch with cover removed, for controlling one of the water-wheel needle valves.

The plant in question is known as Ontario Plant No. 2, located in San Antonio Canyon, and normally takes the entire flow of the stream in this canyon without storage capacity. The plant is installed above two other plants on the same stream and in essentially a by-pass around some low falls and rapids in the head of the stream. All of the water of the stream is required for the two plants below, one of which is Ontario Plant No. 1, and this fact has a decided bearing on the design of equipment for Plant No. 2.

The equipment of Plant No. 2 consists of one single Pelton impulse turbine, overhung from a Westinghouse 500-kva., 50-cycle generator, with direct connected excited. The turbine is rated at 550-hp., 290-ft. head, and receives water through a duplex needle nozzle. A third separate nozzle is used as a by-pass around the unit in order to permit uninterrupted flow to Plant No. 1, in case the upper plant is shut down. All three of the nozzles are operated by electric motors provided with interlocking limit switches, in order to maintain fixed relative action between the three. This arrangement is made for the purpose of maintaining maximum efficiency at all degrees of load and water consumption. Governor operated jet deflectors are also provided for emergency control and speed regulation.

Plant No. 2 is completely controlled from Plant No. 1, situated three and one-half miles down the canyon, by means of a double throw switch. The adjustable contact limit switches in the mechanism of the remotely controlled plant are responsible for the operation of the motors but do not themselves directly affect the operation of the motors. The contact switches act on relays and contactors on the switchboard panel, and these in turn cause the motors to operate. The various operations occur in proper sequence in the following order:

When the plant is operating on full load, both power nozzles are full open and the by-pass nozzle is closed. If it is desired to reject all of the load, the duplex switch in Plant No. 1 is thrown to the "To Close" position, and the first action is to close the relay which starts the closing of the upper power nozzle. After a certain predetermined interval a contact switch on the upper nozzle acts to close a relay, which starts the closing of the lower power nozzle. Then for a certain interval both nozzles are closing together. On reaching a certain point of closing, which corresponds to a predetermined minimum stream flow, a contact switch on the lower nozzle acts to close a relay, which effects the opening of the by-pass nozzle. Then for a short interval both power nozzles are closing and the by-pass nozzle is opening.

The upper nozzle, which starts to close first, reaches the full closed position first, and its limit switch acts to open its closing relay to prevent jamming of the mechanism. By the time the lower power nozzle reaches its full closed position the by-pass nozzle is opened to the predetermined point which discharges the required flow, and the limit switch on the lower power nozzle acts to open all relays and stop all action. Water then flows through the by-pass only and the generator is unloaded and removed from the line.

When it is desired to put the plant on to the line, the duplex switch in Plant No. 1 is thrown to

the "To Open" position and the sequence of operations is started, but in the reverse order, thus:

1. By-pass closes and lower power nozzle opens.
2. Upper power nozzle opens with by-pass still closing, and lower power nozzle opening.
3. By-pass nozzle reaches full closed position with both power nozzles still opening.
4. Lower power nozzle reaches full open position and its limit switch acts to stop all action, both power nozzles being open and the by-pass nozzle closed.

The operation of the plant is not limited only to the full on or off positions, as any position between may be reached and held by the manipulation of the central switch in Plant No. 1. This is a necessary provision to permit the synchronizing of Plant No. 2 with Plant No. 1, and to regulate for different loads or stream flows.

Synchronizing is accomplished altogether by the remote control of the power nozzles, the synchroscope and main generator switch being on the panel with the nozzle control switch in Plant No. 1. A Tirrill regulator is installed at the upper plant to effect voltage regulation of the remotely controlled unit in the normal way through the exciter field.

It was stated above that the unit in Plant No. 2 is intended normally to use all of the stream flow and the capacity of the unit adopted was based on the maximum normal flow indicated by normal run-off records. Only during periods of flood flow is water allowed to run down the creek channel as well as through the upper penstock. During periods of normal or below normal flow, all water available is passed through the penstock to Plant No. 2, and the water consumption of the unit is governed according to the water level in the small forebay, this level being indicated at Plant No. 1 by a long distance water level indicator. The water consumption of the unit is regulated to keep the level of the water in the forebay at a fixed maximum point. This obviously results in a wide seasonal variation in the plant output during the year.

Fourteen conductors are used between Plant No. 2 and Plant No. 1 and consist of the following: Three main transmission wires, three transmission wires for carrying power to the control motors, three wires for the control circuit, three wires for the long distance water level indicator, and two telephone wires.

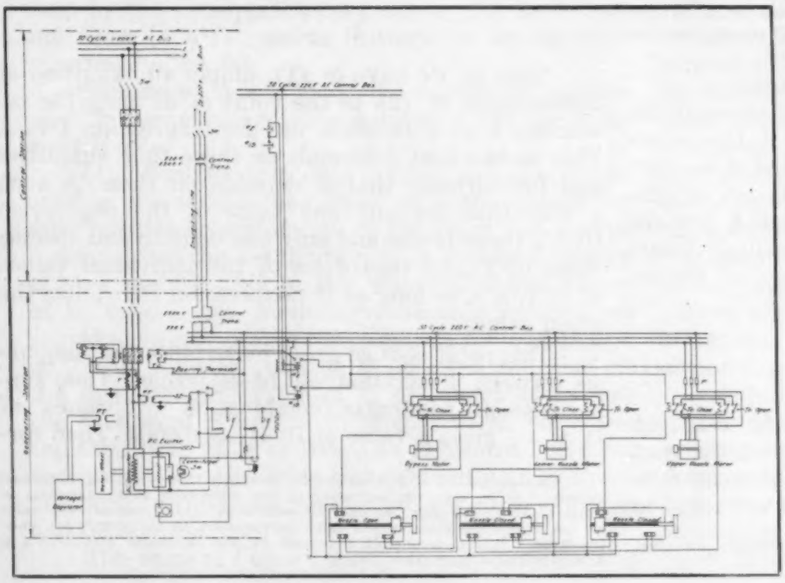
Two switch panels are provided in Plant No. 2. One is for the main transmission circuit and contains an oil circuit breaker with overload trip, an integrating and a graphic wattmeter and a voltmeter.

For the protection of the unit proper, in addition to the overload trips, relays are provided for the operation of all of the other relays, to completely shut down the unit and to open the by-pass in case of over-voltage, low-voltage or excessive bearing temperatures. If the unit is shut down for any of these causes, it is necessary to reset the relays manually, before the plant can again be put in operation. A centrifugal switch is also provided to prevent the operation of the low-voltage relay when the unit is started from rest, normally.

In Plant No. 1 a single switch panel is used for the control of the upper plant. It contains an oil circuit breaker with overload trip, ammeters and wattmeters, the two-point water control switch, the long distance water level indicator and plugs for the voltmeter and synchroscope connections.

The design contemplates the control of all of the operations of starting, synchronizing, building up load, etc., from Plant No. 1. No regular attendant is on watch at the upper plant and only periodic visits No regular attendant is on watch at the upper plant and only periodic visits are made to the plant for daily inspection, oiling and infrequent adjustments of the voltage regulator. The overload trip in the upper plant is purposely set higher than the trip at Plant No. 1, so that it will only operate in case of line trouble between the two plants.

The several months of operation under complete remote switch control since the plant was put in service have shown the system to be sound and the equipment completely satisfactory.



Wiring diagram showing scheme of relays for progressive operation of nozzles and other devices. All of the remote control is exercised through three wires running between Plant 1 and Plant 2. It is to be noted that part of the control devices operate on closed circuit and part on open circuit and that a.c. is used for control circuits.

The Hydraulics of Oil Pipe Lines

BY W. F. DURAND

(Long have engineers desired a general equation that might be used in computing pipe line characteristics for the transmission of air, water, oil or any other liquid. Here is a masterly contribution on this subject by W. F. Durand, professor of mechanical engineering at Stanford University, and an engineer of international reputation. This should add greatly to our present knowledge on this important subject.—The Editor.)

The purpose of the present paper is to call attention to the fundamental problem presented by the flow of viscous liquids in pipes and to note the extent to which existing information may be made to furnish the data necessary for a reasonably satisfactory treatment of actual problems, especially as they arise in connection with the design and operation of oil pipe lines.

We first inquire as to the characteristics or factors which will be determinative in any given problem of pipe line flow with a viscous liquid. It should be noted that, for simplicity, the line is assumed to be horizontal. The changes necessary to allow for differences in gravity level are readily made in accordance with familiar hydraulic principles.

It seems clear that the following is a complete census of all characteristics or factors which can be considered determinative in a problem of this character.

(1) Viscosity of liquid (μ) (absolute units).
(2) Density of liquid (σ) (pounds per cu. ft.).
These two characteristics define the liquid in a mechanical sense.
(3) Diameter of pipe (D) (feet).
(4) Length of pipe (L) (feet).
(5) Roughness of pipe surface.
These three characteristics define the pipe in a mechanical sense. For roughness we have no method of direct measure and no symbol.
(6) Velocity of flow (v) (feet per second).
This is a characteristic of operation. To these we must add
(7) Gravity (g).
This determines the field of gravitational force within which the phenomena of pipe line flow have their being.
Viewed as a resultant of the interaction of the preceding seven factors we shall then have:
(8) Loss of head (h) (feet).
This is, in effect, a measure of the pressure difference required between the two ends of the line in order to insure continued steady motion flow under the conditions assumed.

Fundamental Relation of Factors

If then we are agreed that the first seven of the above factors are all that are involved in the determination of the loss of head No. (8), and if we further agree to neglect variation in roughness, or otherwise if we agree that, for the moment, we are dealing with a standard or uniform quality of surface, then an application of the theory of dimensions* gives the following relation:

$$h = \left(\frac{L}{D}\right)\left(\frac{v^2}{2g}\right)\phi\left(\frac{Dv\sigma}{\mu}\right) \qquad (1)$$

The significance of this equation is far reaching and it will repay the most careful study on the part of all interested in the subject. The treatment outlined in the following numbered sections will serve to indicate the more direct and simple applications to the phenomena of the flow of viscous liquids in pipes.

(1) On the basis assumed, viz., that we are dealing with a standard or uniform quality of pipe surface and that all other quantities and factors entering into the problem are represented in the equation, then it follows, with all the authority of a demonstration in mechanics, that the relation between these various quantities is of the form given in equation (1). This means that this equation is not an approximation nor does it in itself represent a hypothesis or a trial form of relation. The general truth of this relation is susceptible of demonstration with the same degree of rigor as obtains with any proposition in mathematical physics or mechanics, resting as it does on the basic principles of physical science.

The derivation in detail of this relation from basic principles is beside the purpose of the present paper and it is furthermore unnecessary since this has been provided long since by other writers and is well known in the literature of the subject.

(2) In order to show the relation of this equation to more familiar forms let us write it again alongside the d'Arcy equation, familiar to all students of hydraulics, thus:

$$h = \phi\left(\frac{Dv\sigma}{\mu}\right) \times \frac{L}{D}\frac{v^2}{2g} \qquad (1)$$

$$h = f\frac{L}{D}\frac{v^2}{2g} \qquad (2)$$

Comparing these two equations it appears that in this form (1) is is the same as (2) if we put

$$f = \phi\left(\frac{Dv\sigma}{\mu}\right)^{1}$$

That is, we have in (1) simply an extension or development of (2) to the point of defining the coefficient f as a function of the expression $Dv\sigma/\mu$. This means that f depends on these four quantities and furthermore that it depends on them in such a way that for any one value of the expression $Dv\sigma/\mu$ there is one and only one definite and specific value of f, and regardless of the individual values of D, v, σ, μ, so long as the expression $Dv\sigma/\mu$ has the given value.

This point is of so great importance that emphasis through illustration will be desirable. Thus suppose some particular combination of values of D, v, σ μ gives a value of $Dv\sigma/\mu = 6{,}000$. Then cor-

*See among other references, Buckingham, Transactions Am. Soc. Mechanical Engineers, Vol. 37, p. 263.

[1]One advantage of the expression $Dv\sigma/\mu$ is that when the individual values of D, v, σ, μ are expressed in any consistent absolute system of units (foot, pound-mass, second; or centimeter, gram, second) the value of the expression remains the same independent of the system of units employed. This is commonly expressed by the statement that $Dv\sigma/\mu$ is a dimensionless expression.

responding to this value 6,000 as argument will correspond a value of f = say .036. Then no matter what other combination of individual values D, v, σ, μ we may have, so long as the value of $Dv\sigma/\mu = 6{,}000$, so long shall we have the value f = .036. Stated again otherwise, the value f = .036 is applicable to all possible combinations of individual values D, v, σ, μ, so long as their combination in the form $Dv\sigma/\mu = 6{,}000$.

In particular it should be noted that these factors may belong to the same or to widely different liquids. It is only necessary to know the values of the defining characteristics μ and σ. Thus a viscous oil flowing with a high velocity in a large pipe may give the same value of $Dv\sigma/\mu$ as water flowing with a low velocity in a small pipe. In such case, then, the value of f should be the same. This does not mean, of course, the same values of h, since the effect of the other factors (specifically v^2) will be to give a much greater loss of head h for the viscous oil than for the water.

Again, the general laws for the flow of gases and vapors are entirely similar to those for liquids. Hence the same general relation holds for gases and vapors as well as for liquids, or generally for all fluid substances. It is therefore only necessary to know the value of the defining characteristics μ and σ in order to assimilate together in one expression the laws of flow for liquids, gases and vapors, and thus generally for all flowing substances.

Thus again and broadly, no matter what the substance, so long as we know its viscosity and density; no matter what the size of conduit so long as we know its size; no matter what the velocity so long as we know its measure, we may find a value of $Dv\sigma/\mu$ and to this value should correspond one and only one definite value of the coefficient f.

(3) From this it immediately follows that if, through a series of actual measurements, experimental values of f are obtained for a graded series of values of $Dv\sigma/\mu$, and if such experiments are extended over the entire working range of values of $Dv\sigma/\mu$ and at reasonably close intervals, then we may, by the usual graphical process, plot such data and draw in a fair curve through or among such experimental spots.

Such curve should then give a graphical expression for the general relation between f and the argument $Dv\sigma/\mu$.

(4) Such a curve, once in hand and accepted as reliable, we should then have no further need for experimental determination of values of f — always remembering the assumption of a standard quality of pipe surface. No matter what individual values of D, v, σ, μ, the particular case may present, we should have only to find the resultant value of $Dv\sigma/\mu$, go to this point on our axis of abscissæ and read off the corresponding value of f; or otherwise in case the data were presented in tabular form, enter the table with the value of $Dv\sigma/\mu$ as argument and draw therefrom the value of f (either directly or by interpolation) in the usual manner with the use of tables and tabular data.

The value of f once known, we may then proceed immediately to find h by the familiar d'Arcy equation as in (2).

(5) We come next to the practical question, does such information exist? Are we now, on the basis of experimental work, in a position to prepare a chart or table setting forth the general relation between f and the argument $Dv\sigma/\mu$ — always for a standard quality of pipe surface?

The answer is largely in the affirmative. The chief limitations arise from the lack of any standard for quality of surface. We have no scale for roughness nor do we have any direct basis for the measurement of this characteristic as in the case of pipe diameter or velocity of flow.

Large numbers of experiments, however, have been carried out on the flow of various substances such as air, gas, water, oil, etc., in tubes and pipes designated as "smooth" or "new and clean." In so far as the quality of surface involved in these experiments may be assumed to have been fairly uniform, such experimental data should fall in line for the provision of a standard series of values of f as indicated above. We cannot define or specify roughness but we can define, at least in a commercial sense, a smooth surface as one without roughness in degree sensible with regard to its influence on the values of f. If therefore we should find by plotting results from a large number of such experiments on different substances and with widely varying values of D, v, σ, μ, that the resultant values of f plotted on an abscissa $Dv\sigma/\mu$ all fall on or near a smooth continuous curve, a curve clearly representing a law or relation between physical quantities, we should then be justified in assuming that the data thus in hand do represent in effect the results from a series of pipes or tubes or conduits with a sensibly uniform quality of surface. If slight variations one way or the other are noted, if slightly different values are found for the same value of $Dv\sigma/\mu$, or if differences between values nearly the same are somewhat too great to be reconciled with the obvious general trend of the curve, then we may naturally conclude that we have in evidence the influence of slight variations in the quality of the surface. If again we should find certain values which lie consistently higher than the general trend of values, while themselves following the same general slope or form of graphical law, we shall naturally conclude, especially if individual groups of such values belong, each to one particular pipe or conduit, that we have in evidence the influence of a degree of roughness in a given pipe distinctly greater than the general average for "smooth" or new pipe values, and thus giving by the extent of increase of values above those for smooth or new pipe, a form of measure of the roughness as compared with what we may term "commercially smooth" pipe.

Actual examination of the data in hand reveals all of these characteristics. There is a sufficient amount belonging to pipe which may be rated as commercially smooth, to give a good indication of the general run of values for f for such pipe and extending over a wide range of values of the argument $Dv\sigma/\mu$.

Suppose a smooth curve drawn through and among such values, giving in this manner the best indication to be drawn from existing data, of the values of f on the argument $Dv\sigma/\mu$ for what may be termed commercially smooth pipe. We shall denote values of f given by such a curve as standard or normal values.

There are also to be found, lying above the curve of standard values, large numbers of spots which obviously belong to cases of rough pipe and with degrees of roughness, as indicated by the values of f, ranging from barely appreciable indications up to values fifty and seventy-five per cent and even more, in excess of standard values.

(6) There is one exception to the statement that clear indications are found for a general curve of values of f plotted on values of $Dv\sigma/\mu$. This is found in the vicinity of values of the argument $Dv\sigma/\mu$ close about 2,000 or between 2,000 and 2,500.

The general character of the curve of f is shown in Fig. 1.

From very small values of the argument up to values approaching 2,000 we find a clearly indicated branch of the curve A B. For values of the argument close about 2,000 or slightly above, the spots are much scattered and give no definite indication of a consistent law. Soon, however, as we pass to larger values of the argument, we find again clear indication of a branch C D. The point C of this branch lies notably above B, implying a sudden and irregular jump in f close about the 2,000 value of the abscissa. From C the curve gradually and smoothly declines for increasing values of the abscissa, approaching more and more nearly to parallelism with the axis of $Dv\sigma/\mu$ as larger and larger values of the latter are reached.

Since the actual range of working values of $Dv\sigma/\mu$ may extend from lower limits of 10 and below to upper ranges of 300,000 and more, it is found convenient to use a logarithmic scale for $Dv\sigma/\mu$ instead of a natural scale. Fig. 1 is shown with a scale of this character.

(7) Turning again to the two branches A B and C D, the first of these corresponds to the so-called stream line mode of flow; the latter to turbulent flow. It is well known in hydromechanics that a liquid flowing between boundary surfaces, as in the case of a pipe, may exhibit two modes of flow.

In the first the liquid particles follow smooth paths generally parallel to the line of the pipe and without whirls, eddies and contorted motion. Such mode of motion is known as stream line flow.

In the second mode the paths of the liquid particles are confused, comprising eddies, whirls and generally contorted, twisted, turbulent motion superimposed on the general movement of translation along the pipe. Such mode of motion is known as turbulent flow, and the general condition characterized by such motion is known as "turbulence."

Many experiments have been made showing the breaking up of stream line flow into turbulent flow. In such experiments, for example, a colored liquid has been introduced in a thin thread into a stream flowing in a glass tube and as the velocity is gradually increased, a point is found where the coherent clearly defined colored thread suddenly breaks up and disappears as such, the color being generally diffused throughout the mass of turbulent flowing liquid. It is furthermore established by experiment that the combination of conditions which determine this point of abrupt transition from one mode of flow to another is found in the argument $Dv\sigma/\mu$ and that the value which determines such critical point is close about 2,000. The appearance of this zone of uncertainty and confusion in the distribution of the values of f on a chart such as that of Fig. 1 is therefore simply another indication of the existence of this double mode of liquid movement and a location of the transition point at or near the numerical value 2,000 for the argument $Dv\sigma/\mu$.

(8) Turning again to the branch A B, it appears from mathematical discussion, the details of which we shall not here repeat, that this curve is a rectangular hyperbola of which the equation is

$$xf = 64 \qquad (3)$$

or

$$f = \frac{64}{x} \qquad (4)$$

where x = the argument $Dv\sigma/\mu$ and f = the friction coefficient as above.

It appears furthermore, from the theory of stream line flow, that the characteristics of such flow, and the resistance opposed thereto, are only in slight or perhaps negligible degree dependent on the relative roughness or smoothness of the pipe. If this is true it follows that experimental values of f lying within the zone of stream line movement, that is with values of $Dv\sigma/\mu$ definitely less than 2,000, should lie on or near the curve given by equation (3) above, and regardless of the condition of the pipe surface.

Examination of experimental results shows that there is a marked tendency to realize this condition. Spots indicating experimental values are found, whether for commercially smooth or for rough pipe, to fall very near the hyperbola defined by equation (3), and in general with no wider departures one way and the other than may naturally result from experimental errors.

In one respect, however, there is indication of an influence due to roughness of pipe surface. This regards the point of transition from stream line to turbulent flow. There is some evidence that with rough pipe the break over from one to the other occurs at lower values of $Dv\sigma/\mu$ than the 2,000 value which marks the vicinity for commercially smooth pipe. There is need, however, for further experimental investigation regarding these matters.

However, with this reservation, it appears that for all values of $Dv\sigma/\mu$ well below 2,000, whether with commercially smooth or with pipe relatively rough in varying degrees, the value of f should be given directly from equation (4).

(9) Taking next the branch C D, for values of $Dv\sigma/\mu$ definitely above 2,000, there is no algebraic expression for this branch and the mode of procedure for such values will include the following steps:

(a) The numerical value of $Dv\sigma/\mu$ is found.

(b) With this value as abscissa (or argument) take from the curve (or table according to the form of the data) the corresponding value of f. This will apply to commercially smooth pipe.

(c) If the pipe surface is assumed to be rough rather than commercially smooth, a correction is then made by increasing f, according to judgment, to allow for the quality of surface, as assumed.

The following table gives values for f over the usual range for the branch C D and for qualities of pipe which may be taken as "commercially smooth."

TABLE 1

Abscissa	f	Abscissa	f
2,500	.0442	30,000	.0238
3,000	.0426	35,000	.0228
3,500	.0412	40,000	.0219
4,000	.0400	45,000	.0213
4,500	.0390	50,000	.0208
5,000	.0382	60,000	.0200
6,000	.0364	70,000	.0195
7,000	.0350	80,000	.0190
8,000	.0340	90,000	.0185
9,000	.0330	100,000	.0180
10,000	.0320	150,000	.0168
12,000	.0304	200,000	.0158
14,000	.0292	250,000	.0150
16,000	.0280	300,000	.0144
18,000	.0271	350,000	.0140
20,000	.0264	400,000	.0137
25,000	.0249	450,000	.0134

(10) This general method for determining the value of f involves then the following:

For values of $Dv\sigma/\mu$ less than about 2,000, a definite value is given by equation (4), applicable to all qualities of pipe surface.

For values of $Dv\sigma/\mu$ greater than about 2,000, a definite value is given from the curve (or table) for the case of assumed commercially smooth pipe, leaving a correction for roughness of surface to be determined by judgment.

Regarding roughness and its effect on friction head, it is evident, since we are unable to directly measure or numerically evaluate this characteristic, that any allowance for its influence on the friction head must be made as an act of judgment based on the general observed effects of roughness in varying degrees. This must always necessarily be the case so long as we are unable to numerically evaluate roughness and the most that any method of treatment for the problem can hope to accomplish is to provide a definite procedure leading to a definite result, in so far as the four variables, D, v, σ, μ are concerned, and then to leave to judgment, applied to the particular case, the correction (if any) due to quality of pipe surface and involving an attempt to compare the actual or assumed degree of roughness with that constituting a "commercially smooth" surface and an estimate of relative increase in the value of f for the rough as compared with the smooth.

The procedure outlined in the present paper seems to realize this end. By the means indicated, definite values of f may be found for "commercially" smooth pipe and based on observation and experience as it may accumulate, correction (if required) may be made for any assumed degree of roughness of surface.

(11) With regard to the determination of a definite value for f, there is, however, one exception. Close about the value 2,000 for the argument $Dv\sigma/\mu$ there is, as we have seen, confusion and uncertainty. For a value of $Dv\sigma/\mu$ falling in this neighborhood there is, therefore, great uncertainty, and the only safe value of f will be one corresponding to the beginning of the branch C D or a value about .044. All of this, however, corresponds with the facts. Actual conditions here are found to include a wide range of uncertainty and estimates, to be safe, must be made to cover the extreme values.

It results further that this value of $Dv\sigma/\mu$ should be avoided as an operating condition. By a suitable lowering of the velocity the value may be reduced sufficiently to bring the value of f over to or near the lower end of the branch A B. This is, in effect, the most favorable point for operation, so far as pipe line resistance is concerned, and so far as may be found practicable, the conditions of operation should be so chosen as to bring the value of

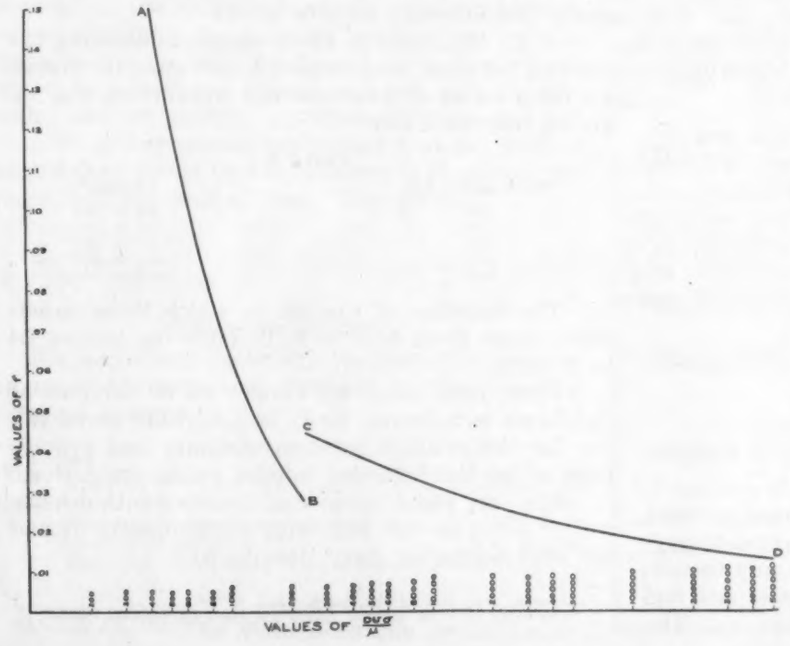


FIG. 1.
This chart is a graphic representation of the above table. $Dv\sigma/\mu$ represents the diameter of the pipe times the density of the liquid and the velocity of its flow, divided by the viscosity of the liquid. When the value of $Dv\sigma/\mu$ is less than 2,000 a definite value of f is given by equation (4), applicable to all quantities of pipe surface. The curve shows a definite value for f when $Dv\sigma/\mu$ is greater than 2,000.

$Dv\sigma/\mu$ down in the vicinity of 1,500 to 1,800 or by a safe margin below the critical value of 2,000 to 2,500.

(12) It now remains to note the units, measurements and numerical values involved in determining the four quantities, D, v, σ, μ.

The fundamental units are taken as the foot, pound-mass and second.

(1) The diameter D is therefore to be measured or expressed with the foot as the unit.

(2) The velocity v is to be expressed with the foot and second as units or numerically in feet per second.

(3) Density σ is to be expressed in pounds per cubic foot. We here meet the condition, however, that the densities of liquids, and in particular of petroleum oils, are commonly expressed in terms of degrees on the Baumé scale. We have also to remember that density will vary with temperature and hence, if the assumed working temperature is different from that used for the determination of the Baumé density, a suitable correction must be made.

To estimate the density of a petroleum oil at any assumed working temperature we have then as follows:

$$\sigma_1 = \frac{8736}{130 + B} \qquad (5)$$

Where σ_1 = density in pounds per cubic foot for oil at 60° F.

B = gravity on Baumé scale assumed to have been taken at 60° F.

$$\sigma = \sigma_1 - \left(\frac{121.2 - \sigma_1}{2713}\right)(t - 60) \qquad (6)$$

Where σ = density in pounds per cubic foot for oil at working temperature of t° F.

t = working temperature assumed.

Equation (6) is simply an empirical relation between density and temperature which is found to be approximately correct for California oils.

(4) Viscosity μ is to be expressed in absolute English units; foot, poundal and second. In common practice, however, viscosity is more usually expressed in terms of t, a time of flow, on an arbitrary or comparative scale, and varying according to the particular instrument employed. The three types of instrument most commonly met with are the Saybolt, Engler and Redwood.

The following equations may be used to convert the time t, representing the reading on these instruments, into values of μ in the units desired.

$$\text{Saybolt} \quad \frac{\mu}{\sigma} = .00000237t - \frac{.00194}{t} \qquad (7)$$

$$\text{Engler} \quad \frac{\mu}{\sigma} = .00000158t - \frac{.00403}{t} \qquad (8)$$

$$\text{Redwood} \quad \frac{\mu}{\sigma} = .00000280t - \frac{.00185}{t} \qquad (9)$$

Where μ = viscosity in absolute English units (foot, poundal, second).

σ = density in pounds per cubic foot.

t = time on instrument (Saybolt, Engler or Redwood) (seconds).

If then the viscosity under the assumed working temperatures is known or assumed, in terms of Saybolt, Engler or Redwood units, we have only to substitute the value t in the suitable formula, and find the value of μ/σ and hence of its reciprocal σ/μ. The latter may then be directly used in finding the value of the argument $Dv\sigma/\mu$ or otherwise the values of μ and σ may be individually employed if desired.

It often happens, however, that values of the viscosity may be known for certain standard or reference temperatures, but not for the temperatures assumed as representing the conditions of operation. To meet this situation there is needed some relation between viscosity and temperature. Such relation, however, is apparently exceedingly complex and does not admit of simple algebraic expression.

Broadly, viscosity varies in inverse direction with the temperature. Thus starting with a high temperature and assuming a gradual cooling it is found that the increase in viscosity is at first slow, the rate of increase rising rapidly as the temperature drops.

Professor W. R. Eckart of Stanford University has pointed out that the relation between viscosity μ and temperature t when plotted on double logarithmic scales shows a close approximation to a straight line, at least over the working range of temperatures for which the liquid may be said to retain its identity. At high temperatures, the more volatile constituents will begin to vaporize and at very low temperatures certain constituents may begin to solidify and separate out, thus in either case changing the character of the liquid itself. Between these limits of temperatures, however, Prof. Eckart has shown by a large number of cases that within the limits of observational error the straight line relation may, for all practical purposes, be assumed to hold.

It thus results that if the value of μ for a given oil is known for two temperatures, the logarithmic plot may be drawn as a straight line between these points and extended over the working range of temperatures, thus giving a direct and practical form of relation between viscosity and temperature and specifically, the value of μ for any specified temperature within the working range.

Among various numerical data regarding viscosity the following may be cited:

A. C. McLaughlin[1] gives diagrams showing the relation between temperature F and absolute viscosity for a series of American oils from which the following may be drawn:

TABLE 2

Temperatures Fah.	Viscosity[2]
60°	.060 to .300
80°	.040 to .250
100°	.020 to .160
120°	.016 to .080
140°	.013 to .045

The densities of the oils to which these values refer range from 56.8 to 60.0. (Gravity Baumé 24 to 18 app.)

From tests made by Cooper on 60 samples of California petroleums, R. P. McLaughlin[3] gives values for the relation between viscosity and gravity from which the following tabular values are derived.

The very rapid increase of viscosity with density will be noted for 60° beginning about density 57 and for 185° beginning about density 60.

[1] Journal, Am. Soc. Mech. Engrs., 1915, p. 263.
[2] The units involved in these values are the foot, poundal, second.
[3] Journal, Am. Soc. Mech. Engrs., 1915, p. 264.

TABLE 3

Gravity Baume	Density at 60° F. Lbs. per cu. ft.	Viscosity[1] at 60° F.	Viscosity[1] at 185° F.
36	52.6	.0040	.00076
34	53.3	.0050	.00090
32	53.9	.0070	.00120
30	54.6	.0103	.00160
28	55.3	.0145	.00206
26	56.0	.0206	.00260
24	56.7	.0280	.00320
22	57.5	.0370	.00380
20	58.2	.0760	.00440
18	59.0	.2640	.00650
16	59.8		.01120
14	60.7		.02450
12	61.5		.14800

From a number of tests made on California oils Dyer[2] gives for oils of four different gravities values of the viscosity for varying temperatures from which the following tabular values are derived.

TABLE 4

Gravity, Baume	18.2	16.6	15	12.1
Density, lbs. per cu. ft.	58.95	59.59	60.26	61.48
Temp. F.	Viscosity[1]			
50°	.7360	.....	.....	.....
60°	.....	1.0530	.....	.....
75°	.2450	.4970	1.5670	.....
100°	.1220	.2230	.3440	.....
110°	.....	.....	.....	1.6610
125°	.0670	.0990	.1500	.6140
150°	.0365	.0490	.0750	.2110
175°	.0242	.0245	.0310	.1020
200°	.0216	.0220	.0220	.0510

The above oils are noted to have contained about 2% of water.

[1]The units involved in these values are the foot, poundal, second.

Again viscosity is frequently met with expressed in terms of metric units. Here again two units may be encountered—the absolute unit based on the centimeter dyne, second, or the centipoise which is .01 absolute unit.

To convert these various measures into one another we have the following:

Viscosity (foot, poundal, second) = viscosity (centimeter, dyne, second) ÷ 14.88.

Viscosity (foot, poundal, second) = viscosity (centipoise) ÷ 1488.

Instead of equation (2) giving in feet the head used up in friction, it is commonly more convenient for practical use to transform the equation in such manner as to give the pressure gradient per mile or otherwise the pressure head used up in friction expressed in pounds per square inch per mile of pipe. To this end we multiply equation (2) by σ and put $L = 5280$ giving pounds per square foot per mile of line and then divide by 144 reducing it to pounds per square inch per mile of line. This gives

$$G_m = \frac{36.67\ f\ \sigma}{D} \frac{v^2}{2g} \qquad (10)$$

Illustrative Examples

We may illustrate briefly the operative steps in the use of the preceding formulæ by the following numerical examples:

Given:

Quantity of oil per day.....24000 bbl.
Diam. of line .....8 inches
Working temperature assumed at .....100° F.
Gravity of oil at 60° F.....18 Baumé
Viscosity at working temperature taken at .12.

We find first $v = 4.47$ (fs)

Then: from (5) density at 60° = 59.02

and from (6) density at 100° = 58.10

We then find the value of $Dv\sigma/\mu = 1443$

This implies stream line motion and (4) gives a value of f about .0444.

Substituting this in (10) we find the pressure gradient 44.1 pounds per square inch per mile of length.

Again if we should take the oil of gravity 16 B. at 60° F. with a working temperature of about 110° F. and a value of $\mu = .15$ we should find similarly a value of $Dv\sigma/\mu = 1166$, a value of f about .055 and a pressure gradient $G_m = 55.2$ pounds per square inch per mile of length.

Again, suppose a 10-inch line with oil gravity 20 B. at 60° F. and at an average working temperature of 110° F. and with a velocity of 5 feet per second. We may then take μ about .06. We then find as above for the density at 110° $\sigma = 57.08$.

This gives a value of $Dv\sigma/\mu = 3964$ implying turbulent flow and for commercially smooth pipe a value of f about .04. If 10% is added for a slightly roughened surface we have $f = .044$ and substitution in (10) gives a pressure gradient 55.2 pounds per square inch per mile of length.

Suppose again that we have a record of $t = 1000$ for the Saybolt viscosity of a given oil at 100° F. Then for the value of μ/σ in absolute units we have from (7) $\mu/\sigma = .002368$ and $\sigma/\mu = 422.3$. Again if $t = 4000$ we shall have $\mu/\sigma = .00948$ and $\sigma/\mu = 105.5$. If in the first case the oil is one showing a Baumé gravity at 60° of 17.5 we shall have from (5) σ_1 at 60° = 59.22 and from (6) σ at 100° = 58.31 and hence μ at 100° = $58.31 \times .002368 = .1381$.

It is, of course, always desirable to have values of μ and σ derived directly by test from the oil in question and at the working temperatures assumed. In default of this precise information, the best practicable approach must be made by a comparison with known data as in tables 1, 2, 3, and through formulæ and relations such as those indicated in the latter part of the present paper.

With reasonably accurate values of μ and σ in any given case and a quality of pipe surface not too far removed from what has been termed commercially smooth, the procedure herein indicated may be followed with confidence regarding the resulting values of f and h or G_m. With old and roughened pipe surface, due allowance must be made by judgment and in the light of such information as may be available regarding the values of f applicable in such cases.

In any case the procedure herein indicated may be urged as undoubtedly more reliable and more widely applicable than any empirical combination of density or viscosity or both in a d'Arcy or other hydraulic formula, but not resting on the basic principles of rational mechanics, as does the method presented herewith.

---

[1]The units involved in these values are the foot, poundal, second.
[2]Journal, Am. Soc. Mech. Engrs., 1915, p. 259.

Article number eleven of the New Physics series by Dr. A. C. Crehore has been held over until the issue of May 15th in order to make room for the special article by the same author which appears on another page of this issue.

Choice of Electrical Equipment for Gold and Silver Mining

BY B. B. BECKETT

(The following detailed analysis of the troubles and cures of electrical mine equipment by B. B. Beckett, mining electrical engineer, have application to other motor applications such as cement works and foundries where severe operating conditions are met. Much of the author's discussion is based upon his extensive practical experience in the mines of Goldfield, Nevada.—The Editor.)

The three-phase system is exclusively used in this industry, except for railways and such special purposes as electrolytic precipitation. This discussion may therefore be confined to three-phase motors and devices. The generating plant will not be included, as that is a subject in itself, although very large and complete generating plants are sometimes operated as part of a mining enterprise.

The choice between synchronous motors and induction motors is an economic problem which must be solved for any particular case and depends upon the value of high power-factor versus simplicity; but, in general, synchronous motors should be used only for large air compressors, motor-generators, centrifugal pumps, and perhaps tube mill drive, although the last item will then require friction clutches for starting.

The choice between squirrel cage motors and slip ring motors is also an economic one to be solved in any particular case wherever the starting requirement is severe. In general, a slip ring motor is preferable to a combination of squirrel cage motor and friction clutch, as friction clutches so used give a great deal more trouble.

Standard stock motors should be used for all ordinary operations both underground and on the surface, except that the more flimsy designs should be avoided. The service is rough as compared with that in some other industries, but the difference is not so great as to justify special design, with attendant difficulty in obtaining replacements and repair parts. For the same reason, all non-standard features should be avoided such as special speeds, special shaft extensions and special brackets on frames, unless these are clearly justified by other considerations. It is also desirable that as many motors be exactly alike as is consistent with good efficiency. It is not so important that they be of the same make as that they be of the same speed and have the same size of shaft extension, so that replacements and exchanges may be made quickly with a minimum number of repair parts on hand.

In regard to speed, it should be noted that high speed motors are not only cheaper but usually also more efficient. They have the additional advantage of being lighter and easier to handle. No objection can be made against the high speed, mechanical or electrical, so far as the motor itself is concerned, but considerations of drive fix certain limits, as given in the table below. This table is based upon the writer's experience, taking into consideration the quality of construction and the kind of operators usually found in mining camps. The recommended speed for gearing is much lower than for belting. This refers to plain spur gearing. If herring-bone gearing is used, or if a flexible coupling is interposed between motor and first pinion, the speed recommended for belting may be used, and the same is true for silent chain. In general, plain spur gearing should be avoided except where the service is light or infrequent.

Direct connection is, of course, the ideal drive and should be used in all cases where the speed of the driven machine is suitable, except where it may be desired to change the speed readily. Even where the desired speed is so low as to call for special motors, this is frequently justified by the advantage of direct drive, but each particular case of this sort must be figured out for itself. It should be noted here that direct connection does not mean merely coupling a motor direct to drive shaft that is itself geared to the machine proper, as in a triplex pump. This would be a gear drive and only low speed motors should be used for this purpose; but such an arrangement is decidedly preferable to a high speed motor with double reduction gearing. For true direct drive, like that of a centrifugal pump, the higher the speed the better, up to 1800 rev. per min., and even 3600 is satisfactory for small sizes, so far as the motor is concerned.

MOTOR SPEEDS RECOMMENDED
60-Cycle Motors

Motor rating, hp.	REV. PER MINUTE —For Belting— Highest allowable	—For Belting— Most desirable	—For Gearing— Highest allowable	—For Gearing— Most desirable
1	1800	1800	1200	900
2	1800	1800	1200	900
5	1800	1200	900	900
7½	1800	1200	900	720
10	1800	1200	900	720
15	1200	1200	720	600
20	1200	900	720	600
30	1200	900	720	600
50	900	900	600	600
75	900	720	600	514
100	900	720	600	514
150	720	600	514	450
200	720	600	450	400

In modern starters a number of special features have been incorporated. A low-voltage release and overload relays should always be provided and should be inside the starter case or integral with it so that the wiring is enclosed and the mechanism entirely dust proof. The mechanism should not be readily accessible, else it is liable to be blocked or the setting to be changed. The starter case should be arranged for conduit wiring. The push-and-pull type of handle is usually preferred by operators, that is, the handle at the side of the case instead of in front. Quick-make and quick-break movement is greatly to be desired, but is not yet available except in electrically operated starters. The ammeter as a starter feature is also to be recommended in most cases for large sizes, say 50 hp. and over. It should be connected in circuit in starting as well as in running, for its chief use is in starting to determine when the motor has come up to speed ready for the throw-over. It

should, of course, have a scale reading high enough for the starting current, about four times normal full load current. This will make the running current rather low on the scale, but this is desirable too in most cases, else the continual swinging of the needle under load fluctuations will make accurate readings impossible and also wear out the meter. It is not necessary to read accurately. The operator will soon learn about where the needle normally stands, and will note an unusual position, indicating trouble somewhere.

Electrical Equipment of the Mill

Starters are not usually provided with motors of 5 hp. and under, but they may be desirable down to 2 or even 1 hp. in order to reduce the jerk that accompanies starting direct on the line; and they may be omitted with much larger sizes, 20 or even 30 hp. if the starting jerk is permissible and if the line will stand the current rush without too much voltage disturbance to other motors. However, there is not much saving in omitting starters with large motors, since an oil switch must be provided instead large enough to handle the heavy current.

When no starter is used, the switch that takes its place should be of one of the modern "safety first" designs. It should be enclosed to prevent accidental contact, should be either an oil switch or else provided with barriers to prevent flash-over, and should be of quick-make and quick-break design. It should be equipped with low-voltage release unless the conditions are clearly such that no danger can result from unexpected starting after an interruption of power supply. For overload protection, simple fuses are about as good as anything else; but if low-voltage release is used, then it is well to use overload relays also, since these can be added at little expense. If relays are used, these should be in circuit both in starting and running and no fuses should be used at all unless the service line is long enough to require fuses at the branch point.

The matter of overload protection is in flux. There is no device on the market that will protect a motor against overload under all conditions, and the main reliance must still be put in the watchfulness of the operator and the fact that the motor has been made large enough to carry any load likely to come upon it. Simple fuses, if used, must be 50% to 100% larger than the size corresponding to the normal current, in order to avoid the nuisance of unnecessary shut-downs. Instantaneous circuit breakers must be set about 200% over normal load, and inverse time relays at least 50%. At first thought, it may seem that the inverse time relay could be designed with a sufficiently long time element to correspond with the rate of the heating of the motor, so that it will not trip until the motor is really in danger, and still have a continuous current rating that is safe for the motor. The reason this cannot be done is that this device is lacking in two particular principles. It takes no account of atmospheric temperature nor of the preceding load. In other words, the motor may be very hot when the overload begins and therefore the time element of the relay must be short or the motor will be damaged, but this same time element at another time, the motor being cool, will result in unnecessary shut-down. What is really needed is some form of heat storage or "thermo-relay." The fusible link and heating element type of plug fuse now on the market is a step in this direction.

With the starters now on the market, the relays are in circuit only in running, being too quick acting to take the starting current of large motors, and it is therefore necessary to provide additional protection against short circuit in starting. Simple fuses are sufficient for this and these may be the fuses at the branch point, which are required anyway, unless the service line is very short.

For variable speed motors in hoisting or similar service, the simple drum controller is satisfactory up to about 50 hp. Above this, if the service is frequent contactors should be used in the primary circuit, and above 100 hp. full contactor with automatic notching up should be used. The liquid rheostat, because of maintenance difficulty, is not to be recommended except for large hoist motors. The tendency is toward contactor control for all sizes. Regarding regulation of load fluctuations, by fly-wheel or other device, the tendency is toward omission of all such complications unless the characteristics of the power supply system make regulation imperative. This depends primarily upon the size of the system, particularly upon the aggregate fly-wheel effect of rotating apparatus connected to the system in the immediate district. As a rough rule, hoist motors may be used without regulation up to a rated capacity for any one motor equal to 10% of the average steady load on the same substation or generating station, as the case may be. This limit may be considerably exceeded without serious trouble, but the service will not be good.

Regarding protective devices for variable speed motors, these are of little importance in any case where the motor runs only when an operator has his hand on the controller. Low-voltage release is of no benefit and overload protection should be looked upon as short-circuit protection merely. Any overload device must be set at least double the normal load.

In underground service, standard motors and control devices are satisfactory. The standard insulation will not last as long as above ground, but special insulations, so far as the writer has tried them, are very little better. In precious metal mines, inflammable gases are not to be feared and it is usually practicable to protect the motor from dripping water and acid. All electrical equipment underground will fare better if always kept warm, either by load or special means. In Goldfield, the life of windings underground was only one to three years, but this short life was due in part to the fact that these motors were usually geared and therefore subjected to vibration and were oil soaked.

The best method of wiring, above ground, is in rigid iron conduit, if properly done, but open wiring is better than conduit wiring improperly done. In general, services and small branches should be in conduit; but for mains, where they can be run overhead in the clear, the advantage is too small to jus-

tify the expense. Metal service boxes should be provided to house the branch switch and cutout and the wiring from this on to the motor should be entirely in conduit. When the installation is large, requiring heavy copper mains, these should be broken up into several circuits and should be grouped by circuits and not by phases, in order to avoid excessive inductive reactance. For instance, at the Consolidated mill in Goldfield, the reactive drop was actually about 12 times the ohmic drop in the 440-volt mains.

Wiring underground should never be in iron conduit, as it is liable to be eaten through by acid water and will then be worse than nothing. In shafts and main tunnels, lead-covered cable should be used. Elsewhere, up to 600 volts, open rubber-covered wire is satisfactory if guarded against accidental contact. Most underground construction in precious metal mines, except in main shafts and tunnels, is temporary, but is frequently in service much longer than expected and the tendency to flimsy construction should be combated. Switch boxes, telephone cases, and other boxes housing electric equipment should be kept warm by means of an incandescent lamp constantly burning inside in order to prevent deterioration of insulation and the leakage of current across slate and porcelain surfaces.

The Velocity of Propagation of Gravitation

BY A. C. CREHORE, Ph.D.

(Whether the force of gravity, or the force acting between two bodies in space is instantaneous or necessary time must elapse before this force becomes effective, has ever been a subject that has perplexed scientists the world over. If such a time must elapse the time interval must necessarily be very short. Here is an interesting discussion on this important point by Dr. A. C. Crehore who has for some months past been contributing a notable series of articles on the new physics to the columns of the Journal of Electricity.—The Editor.)

The following remarks have been prompted by a sentence in the short paper by A. H. Halloran in the Journal of Electricity for March 15, 1920, in which reference is made to my theory of gravitation. The sentence has particular reference to the old question of the velocity of transmission of the gravitational force, and reads: "Newton's law of **instantaneous** gravitational action, however, is upset by Einstein's deduction that no action can exceed the velocity of light."

No statement as to the velocity of transmission of the gravitational action is to be found in Newton's original statement of the law of gravitation. And, moreover, it was not Einstein who first introduced the conception that all effects propagated through the ether of space take place with the velocity of light. This is the fundamental basis underlying the current form of electromagnetic theory as exemplified by the Lorentz form of this theory.

Gravitation an Electromagnetic Phenomenon

As soon as we abandon the idea that the gravitational force is an effect peculiar to itself, and not at all connected with electromagnetic phenomena, and adopt instead the form of the gravitational equation which I have deduced by means of a modified Lorentz theory, modified to make the dimensions of the equation agree with the dimensions of a mechanical force, we have then included gravitation in the realm of electromagnetic phenomena.

This automatically means that none of the effects comprehended within my theory are propagated with a speed exceeding the velocity of light.

It was probably Laplace's celebrated treatment of the motion of a comet under the influence of the sun's attraction that focused the attention of the world on the subject of the velocity of transmission of a gravitational influence, no mention of which is contained in Newton's original statement. So that it now seems advisable to look at the question afresh, that is to say from the standpoint of the author's theory of gravitation.

The Hypothesis of Laplace

Laplace made the hypothesis that the gravitational force was due to some unknown influence emanating out in straight lines from the sun, and meeting the comet at each point of its path as it described a hyperbolic orbit around the sun. On this hypothesis he reached the entirely legitimate conclusion that the comet must deviate by an easily observable amount from a true hyperbolic path, if the supposed unknown influence constituting the gravitational force were propagated with a velocity equal to that of light. He showed that the path would deviate less and less as its velocity is increased more and more, but at the same time that the deviation from the hyperbolic orbit would still remain within observable limits even if the velocity of his supposed gravitational influence exceeded the velocity of light many times.

This gave rise to the notion that this gravitational influence, whatever it was, must travel at a very excessively great speed, say an infinite speed, if we please; for this would really be required to prevent the orbit from deviating theoretically at all from the exact hyperbola.

Physical Phenomena Which Make Up Electromagnetic Theory

Let us, therefore, examine more attentively the physical phenomena which form the foundation in electromagnetic theory of the present view of gravitation. An infinite velocity really implies that the effect has already traversed the distance, say from the sun to the comet, and is already there, so to speak, at the point of the orbit in question even before the comet has reached this point of its future path. This is shown to be exactly the state of things when the theory of gravitation described in "The New Physics" is examined in detail.

To fix the ideas, consider the effect of a single electron in space revolving at a uniform rate in a circular orbit, this electron being, so far as we are now concerned, the only one in existence. Let the circle of its orbit be represented by the small circle, e_2, at the right of Fig. 1, in the plane of the paper.

Lorentz' Theory

According to the Lorentz electromagnetic theory this revolving electron radiates out its influence in all directions in space, and, assuming now that this electron has been so revolving for an exceedingly long time, its influence has had sufficient time to travel to the uttermost limits of space, as far as the imagination can travel.

The general form of the mechanical force equation, due to Larmor and Lorentz, which a charge e_2 exerts upon a charge e_1, is

$$\mathbf{F} = e_1\left(\mathbf{E} + \frac{1}{c}\mathbf{q}_1 \times \mathbf{H}\right),$$

where e_1 represents the electrical charge upon which the force is exerted, and $\mathbf{q}_1$ is the vector velocity of this charge. If there is no second charge, e_1, there is no mechanical force F, the expression reducing to

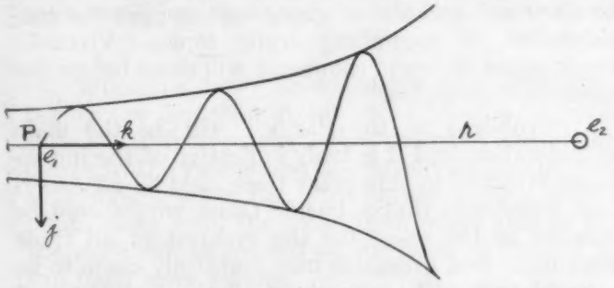


Fig. 1—Diagram to show the effect of a single electron in space revolving at a uniform rate in a circular orbit. The circle of its orbit is represented by the circle e_2 at the right of the figure.

zero. And, again, if there exists a charge, e_1, and its velocity, $\mathbf{q}_1$, is zero, meaning that it is at rest, the second term of the expression vanishes, leaving

$$\mathbf{F} = e_1\mathbf{E}$$

E and **H** are vector expressions sometimes called the electric and magnetic components of the electromagnetic force, but they only become forces when multiplied by an electrical charge.

Suppose now that a stationary charge, e_1, suddenly appears at some point of space, P, being created if necessary to aid in the mental picture, it will at once and **immediately** experience the force $e_1\mathbf{E}$ corresponding to its location with respect to the revolving electron, e_2, without any delay whatever, for the field **E** is already there, so to speak. This would be true wherever one placed the charge, e_1, for the field of e_2 has already traversed all space, which may be considered to be filled with standing electromagnetic waves.

The Question of Distances Between Charged Bodies—

When the distance is great between e_1 and e_2 it may be shown that the force $e_1\mathbf{E}$ according to the Lorentz theory, assuming the conditions to be as represented in Fig. 1, may be very approximately represented by the equation

$$e_1\mathbf{E} = -\frac{e_1 e_2}{r}\frac{\beta_2^2}{a_2}\cos\left[w_2\left(t - \frac{R}{c}\right) + \theta_2\right]\mathbf{j}.$$

The axes of the reference here, i, j, and k, are centered at the point P, the k-axis coinciding with the line joining centers in the plane of the paper, the j-axis being directed downward in the figure, and the i-axis being upward perpendicular to the paper. The distance from e_2 to e_1 is denoted by **R**, and this at great distances is not sensibly different from the distance from the center of the orbit of e_2 to the fixed e_1, denoted by r. w_2 is the angular velocity of the electron, e_2, in its orbit, c the velocity of light, a_2 the radius of the orbit of e_2 and β_2 its speed in terms of the velocity of light as unity.

The whole force is evidently a simple harmonic force along the j-axis coinciding in frequency with the revolution of the electron, e_2. At some time in its cycle of variation this force is evidently zero at the point P; but it is not then zero at other points along the line joining centers. When the force is zero the cosine must be zero, and we have

$$w_2\left(t - \frac{r_1}{c}\right) + \theta_2 = \frac{\pi}{2},$$

where r_1 now represents the distance to P. As the point P moves towards e_2 we eventually arrive at a new position, r_2, where the force is zero at the same time, and

$$w_2\left(t - \frac{r_2}{c}\right) + \theta_2 = \frac{\pi}{2} + 2\pi$$

By subtraction

$$\frac{w_2}{c}(r_1 - r_2) = 2\pi$$

$$\text{or} \quad r_1 - r_2 = \frac{2\pi c}{w_2} = \frac{2\pi c}{2\pi n} = \frac{c}{n},$$

where n is the frequency of the vibration. This change in the distance is merely the wavelength, λ, since

$$\lambda = \frac{c}{n} = r_1 - r_2.$$

The Mapping of the Field of Force

The whole field of force may then be mapped out along the radius r by laying off equal intervals, λ, and by representing the force at intermediate points by a harmonic curve, as in the figure. The amplitude of the harmonic curve, however, must increase as e_2 is approached because of the factor, $\frac{1}{r}$, in the coefficient of the equation. At half the distance the force is doubled, and so on. This curve represents the force at each point at the same instant of time. As time passes, this field would present the appearance of waves traveling outward from e_2 with the velocity of light, although the harmonic force at each point remains fixed and stationary. The case is very analogous to one of the electric advertising signs in which an effect is made to appear to be propagated with considerable velocity, merely by giving a harmonic variation to the light intensity of each fixed lamp.

Similarly, along every radius emanating from the center of the orbit of e_2 there is formed a like picture, and, were these waves visible, they would appear to be streaming out from this center with the velocity of light. But, the velocity with which these waves travel has nothing to do with the so-called velocity of propagation of the gravitational effect. The field is already there, and is definite and fixed at every point of space surrounding e_2 long before the electron e_1 entered the region.

When the second charge, e_1, enters this field, or rather moves about in it, for it could hardly escape always being in some point of the field, the effect that it experiences is due to the existing field already at the point in question, an effect already present, and requiring no time for its transmission from some distant place.

The very fact that the difficulty of Laplace, really injected into the subject because of his concept of the cause of the gravitational effect, has vanished into nothingness by considering the definite physical concepts of the author's theory of gravitation as dependent upon an electromagnetic basis,—this in itself furnishes strong reasons in support of the new theory.

In conclusion, it ought to be pointed out that the forces which have been used above, both in the equation and its graphical representation in Fig. 1, are but one component part of the total force, namely, that part which varies inversely as the distance. There is no component of this inverse distance force that acts along the line of centers, r, so that the author's gravitational force is not represented in this diagram at all.

The Magnitude of That Part of the Force Varying as the Inverse Square

The magnitude of that part of the force varying as the inverse distance may, however, be made far greater than any component varying as the inverse square or higher powers merely by taking the distance, r, large enough. Assuming that the figure represents large distances only, the force there represented would not be changed in sufficient degree to be perceptible to the eye by the addition of all other components. This inverse distance component of the force, however, illustrates the matter of the standing waves, that is, waves which do not change their magnitude with time at a given point in space, and takes care of the matter of the velocity of propagation of gravitation with which we are immediately concerned, just as well as if the inverse square component were used alone in the diagram. The reason for illustrating by means of the former instead of the latter, or the real force in question, is because the inverse distance component is capable of simpler mathematical expression, and is adapted to be illustrated by a diagram.

This inverse distance component is by far the greater force, and, while it contributes nothing to the gravitational effect, yet in the author's theory of the atom this is the force that is concerned with the radiation of energy.

THE FOREIGN TRADE CONVENTION

Probably the greatest international conference of business men ever held is to take place in San Francisco, from the 12th to the 15th of May. This is the Seventh National Foreign Trade Convention, and while it is termed "national" and is truly such in that its prime aim is the promotion of American commerce, yet this year it takes on an international character because of the great number of delegates coming from all parts of the world. These delegates are already arriving, and when gathered together they will represent every country bordering on the Pacific, besides the nations of Europe and those on the eastern coast of South America. The total attendance will in all likelihood exceed 2500.

The convention will be presided over by James A. Farrell, of the United States Steel Corporation, chairman of the National Foreign Trade Council, under whose auspices the convention is called. O. K. Davis is secretary of the Council and has directed the preparations for the conference, assisted by C. P. Converse, Pacific Coast secretary. The program will consist of general sessions, in which the broad questions of American commercial policy will be discussed, and also of group sessions, for the consideration of specialized trade topics. Virtually every phase of world commerce will come before the assembled delegates.

"Problems of the Pacific" will be the main consideration, and it is truly indicative of the importance attached to this great trade field by all American merchants that a Pacific Coast port should be selected as the scene for the greatest of all trade meetings. San Francisco may rightfully claim to be a world port. The growth of all the Pacific Coast ports has been phenomenal, their total exports and imports having risen from $238,000,000 in 1912 to $1,114,000 in 1919.

To men of the electrical industry the convention holds much of interest, and they will be well represented, despite the attractions of the other great Pacific Coast gatherings. The exports of electrical machinery and apparatus this fiscal year will probably exceed $80,000,000 in value, the principal items being motors, dynamos and generators, insulated wire and cables, and batteries. It is interesting to note, however, that exports of electrical heating and cooking apparatus have doubled within the year. Much needs to be done in the development of this export trade to the Orient and Latin America, and unquestionably the convention will aid in its promotion.

Among the delegates already enrolled for the convention are:

D. A. Merriman, American Steel & Wire Co., Chicago, Ill.; F. V. Burton, Bryant Electric Co., Bridgeport, Conn.; Fred B. Whitney, Deselektro Co., Evans Bldg., Washington, D. C.; Alex. S. Tilley, Foundation Co. of New York, 58 Sutter Street, San Francisco; M. A. Oudin, New York City, Chas. M. Muchnic, Schenectady, and G. I. Kinney, San Francisco, all of the International General Electric Co.; R. C. Lanphier, Sangamo Electric Co., Springfield, Ill.. R. E. Martinez, Westhouse Electric & Manufacturing Co.

SPARKS—Current Facts, Figures and Fancy

(The radio duck, power plants on the Panama Canal, the electric auto heater, new electric cast-steel cables—facts of import and facts of fancy alike find space in the following columns. The latest uses of electricity in the world of the movie man, the farmer and the housewife, are also recorded along with a brief summary of reconstruction progress across the Atlantic. —The Editor.)

Aluminum is being considered by the Japanese hydroelectric plants to replace copper in their heavy transmission cables. Copper has been used exclusively for this purpose heretofore, but even with a 25 per cent duty, aluminum can compete successfully on the basis of price.

* * *

Great honor is due any factor which makes "four blades grow where three grew before." And this very honor is rightfully due electricity, since the announcement that certain Western green-house men have "forced" lettuce by regulating the growth by an elaborate electric lighting system. Four crops of lettuce are thus matured in the same period ordinarily required for three.

* * *

When the movie photographer finds difficulty in taking the day-time street scene because of necessary traffic interruption, the powerful searchlight comes to the rescue and allows him to do the work at midnight when the streets are clear. Searchlights shine upon the scene from every side so that the work can be carried on the same as though the sun itself were shining.

* * *

During the month of January the total gross output of both plants on the Panama Canal was 5,894,400 kw-hr., the total power distributed to consumers being 5,006,940 kw-hr. The total loss of power plant auxiliaries, transmission, transformation and operation of steam plant generation for standby service was 887,560 kw-hr., or 15.06 per cent of the gross output.

* * *

The use of electric stoves and heaters is ardently encouraged in view of the fact that sixty million tons of fuel must be saved annually in this country to insure an adequate supply for the winter months. It is estimated that a saving of from three to four tons of coal a year is made where the average family uses electricity exclusively for cooking purposes. The extensive use of electric stoves and heaters is evident from the fact that sixty-three various styles of stoves and heaters have been placed on the market by one manufacturer.

* * *

As in the old war days, we are always ready to greet reports of progress "over there." It is encouraging to know that 6,000 miles of the 50,000 miles of barbed wire laid in northern France during the war have been rolled up. Figures on the reconstruction of homes in France show that 60,000 of the 550,000 houses wrecked by shell fire have been made habitable, mostly with temporary repairs. Of the 1,160 industrial plants destroyed, 588 have been repaired. The government has repaired 2,016 kilometres of the 3,246 kilometres of railways that were torn up and 700 of the 1,675 kilometres of canals rendered useless are again in commission.

* * *

With the greatly increased output of ships in America, a noticeable shortage of chain cables and wrought iron suitable for their manufacture has arisen. An American company has developed the manufacture of electric cast-steel cables, and has submitted samples of four different sizes to very severe tensile and shock tests, the results showing the tensile strength to be from 73 to 93 per cent over that required by the statutory tests for iron cables, and the resistance to shock being still greater than these proportions. Since the results were so satisfactory, the surveyors have recommended that sanction should be given for the use of such cables.

* * *

The latest wireless instrument seems to be none other than our old friend the duck. An ingenious youth, formerly a wireless operator, has discovered that he can communicate with a friend living about 200 yards away by means of a certain duck which has an unusually loud and penetrating voice. When the duck is taken up in the operator's arms, it rapidly responds with a long-drawn "qua-a-ack" if it is gently pulled by the tail and held for a second or so. On the other hand, the duck shoots out a short, sharp quack when his tail is pulled and let go instantly. The young man now sends his messages by Morse code to his friend, who is looking for an equally intelligent duck with a voice of 200 yards' range with which to reply.

* * *

Where the winters are very cold there is real danger in leaving the auto unprotected on the street, and so the electric street heating station has been developed. The station is so effective and practical that the day may not be far distant when such stations will be erected on poles throughout the city so that no motorist need leave his machine unprotected from the harmful consequences of severe cold. The station already established has two outlets. Cars which use it are equipped with ordinary household heating appliances, which may be placed beside the motor to keep the water-cooling system from freezing up and to insure easy starting, and which may as easily be installed in the body of the car to maintain a pleasant atmosphere for passengers.

PERSONALS

Lafayette Hanchett has been elected president of the Utah Power & Light Company at a recent meeting of the board of directors. Mr. Hanchett succeeds **D. C. Jackling**, who resigned from the position a short time ago. Mr. Hanchett is a prominent mining engineer and has long been active in a great number of industrial and commercial activities. He is president of the Intermountain Electric Company of Salt Lake City, and also of the Dixie Company which operates in southern Utah. Mr. Hanchett is a director in the National Copper Bank and Trust Company of Salt Lake City, and is identified with several other large enterprises. Mr. Hanchett acted as assistant to Mr. Jackling, former president of the company, in managing the government powder plant at Nitro, West Virginia, during the war.

G. H. Jamison and **H. S. Peck**, formerly connected with the Milwaukee electrification, are now connected with A. H. Cox & Company, engineers and contractors, 307 First avenue South, Seattle.

W. A. Patton, construction manager of the Stone & Webster division of construction and engineering, Boston office, was in Seattle early in April. He returned to Boston by way of California and Texas.

James D. Howe, general counsel, **W. H. Somers**, freight traffic manager, and **E. O. Barnes**, manager, Seattle division, Puget Sound Power & Light Company, visited the Boston office recently. Messrs. Barnes and Somers have returned to Seattle. Mr. Howe has not yet returned. The trip was made in connection with business of the district.

C. C. Turlay, for ten years in charge of the Vancouver plant of the Portland Railway, Light & Power Company, but who for the last three years has been in other places, has now returned to the company in that city. He will act as commercial engineer and the present personnel of the office will not be changed. **Forest Gay** has charge of the office and business.

Fred D. Weber, electrical engineer and vice-president of the State Board of Engineering Examiners, state of Oregon, has gone to Chicago to attend the National Convention of the National Fire Protection Association, May 3, 4, 5 and 6, 1920. On the 7th of May he will attend a meeting of the Electrical Council of the Underwriters' Laboratories, Inc., of which he is a member. He will return about May 12th to Portland.

M. T. Crawford, superintendent of distribution of the Puget Sound Power & Light Company, Seattle, has returned from an extensive trip through the East during which he studied underground d.c. and a.c. installations so as to apply the information that he gained to such extensions as the Company may be called upon to make. He visited Schenectady, Pittsburgh and other large cities of the East and returned home by way of Omaha, Denver and Los Angeles.

John C. Jones, manager of the Westinghouse Electric & Manufacturing Company's office in Salt Lake City, has been transferred to the management of the supply department of that company in Los Angeles. Mr. Jones has been for nine years with the Westinghouse office in Salt Lake City. **W. A. Moser**, formerly an engineering salesman for the company in Salt Lake City, will succeed Mr. Jones.

C. B. Perkins of New York, director of the Pacific Gas & Electric Company, is spending some time on the Pacific Coast. He has been spending a short time in San Francisco recently.

E. G. Waters, general sales manager for the General Electric Company, was a recent Los Angeles visitor. He will include other Coast cities in his trip before returning to Eastern headquarters.

B. M. Maddox, vice-president of Mt. Whitney Power & Electric Company, **E. L. Bowler**, district manager at Tulare, **R. I. Carruthers**, district manager at Visalia, **R. R. Walbridge**, district manager at Porterville, and **R. E. Bacon**, district manager at Delano, were recent visitors in Los Angeles.

A. D. Page, sales manager of the Edison Lamp Works, and **G. C. Osborn**, assistant sales manager, together with **T. J. McManis**, manager of the publicity department, are visiting the Pacific Coast, and will address the agents of the Edison Lamp Works in the Palace Hotel on May 7, 1920.

W. G. Devereux, consulting engineer for the W. C. Duncan Contracting Company, and **Wm. H. Mader**, of San Francisco, were in Susanville, California, recently for the purpose of examining the tunnel side of the Leon Bly Eagle Lake irrigation project, with a view to entering into a contract for the tunnel construction.

S. C. Haver, Jr., credit agent of Southern California Edison Company, has been appointed employment agent for that organization. This is a new department created for the purpose of handling the employment of all clerical, technical and operative help. The objects of the office are to secure the best man for every job, to improve the personnel in general, to transfer men who have not proven satisfactory to other positions for which they are better fitted, and to relocate men who are apparently inefficient, placing them where they may have another chance, thus saving the expense of breaking in new help and also reducing the labor turnover.

A. C. McMicken, sales manager of the Portland Railway, Light and Power Company, is doing some splendid work for the forthcoming convention of the N. E. L. A. at Pasadena insofar as representation from the Northwest is concerned. Visitors from the North will arrive in San Francisco May 16th at 9:50 a.m. on special train No. 53, and leave for Pasadena at 3:30 p.m. on train No. 110, arriving in Los Angeles at 8:45 the next morning. This will give the visitors from the North time to attend some of the sessions of the Pacific Coast Section, N. E. L. A. Convention, which convenes at Hotel Huntington on that day.

R. C. Smith, up to this time manager of the field photo service department of the McGraw-Hill Publishing Company, has been transferred to the San Francisco office where he holds the position of advertising manager for the Journal of Electricity. This work was in the past managed by A. H. Halloran, formerly assistant business manager for the Journal of Electricity, now Pacific Coast representative of McGraw-Hill Book Company. During the war Mr. Smith was active in the U. S. Air Service. Since Mr. Smith's duties as photographic intelligence officer during the war covered the taking of pictures at 6000 ft. elevation, sometimes exhibiting whole cities and towns in one stretch, it is believed that his activities in the future will not only be helpful in supporting the advertising of the Journal of Electricity, but will also help to secure, in later aerial flights, pictures of some of the possible vast water power developments of the West.

E. O. Eastwood, professor of mechanical engineering at the University of Washington, is to represent the Pacific Coast states on the national nominating committee of the American Society of Mechanical Engineers which is to assemble at the semi-annual meeting of the society at St. Louis, May 24th and 26th. Mr. Eastwood goes as an alternate for Robert Sibley, editor of the Journal of Electricity, who was unable to fulfill this function due to the heavy activities connected with the forthcoming electrical convention of the National Electric Light Association, both of which meet in California practically at the same period the meeting takes place in St. Louis. Professor Eastwood has for many years headed the mechanical engineering work at the University of Washington and is recognized as one of the most able mechanical engineers of the Northwest. The interest he has taken in forming the Seattle Section of the American Society assures the West that it will have an able exponent and champion at the coming gathering.

Robert L. Watts, mechanical superintendent for the St. Paul and Tacoma Lumber Company of Tacoma, Wash., is a recent San Francisco visitor. Mr. Watts has had an important part in the electrification of many of the lumber mills in the Northwest and is the inventor of a recent pulley design made by compressing spruce.

C. D. LaMoree has joined R. B. Clapp in the firm of Clapp and LaMoree, engineering and sales representatives. Mr. Clapp has been in business in Los Angeles for many years and has taken on many lines of interest to the electrical trade. Mr. LaMoree is an old employe of the Westinghouse Company. They will have headquarters at 406 San Fernando Building, Los Angeles.

A. H. Patterson, former vice-president and general manager of Phoenix Glass Company, New York, now retired, is spending a few weeks on the Pacific Coast meeting old friends. Mr. Patterson first visited California in 1875 via stage coach from Portland, Ore. He was at that time a salesman of lighting fixtures.

W. S. McCormick has been re-elected senior vice-president of the Utah Power & Light Company. He has held this position ever since the inception of the company. **John C. Howard**, president of the Utah Oil Refining Company, has been named director of the Utah Power & Light Company, **S. R. Inch** has been re-elected vice-president and general manager, and **G. B. Thomas**, secretary and treasurer of the company.

M. Imai, consulting engineer for the South Manchurian Railroad of Northern China, is a recent San Francisco visitor. He is making an investigation of high-head hydroelectric power development both in this section of the country and also in Europe.

Charles R. Crane, United States minister to China, passed through San Francisco last week on his way to the Orient. He addressed the San Francisco Commonwealth Club on Tuesday noon, April 27th, where he gave a most satisfactory review of social and economic conditions in Russia, Syria and China. He asserted that his instructions from the President were full and complete. Mr. Crane was sent three years ago as a member of the President's special commission to Russia and from his experience there was able to explain many interesting facts in connection with the eastern situation. The ambassador sailed for the Orient on the 29th of April.

R. Q. Cleavenger of Phoenix Glass Company is again on the Pacific Coast.

F. E. Johnson, vicepresident of the M. W. Kellogg Company of New York, is a recent western visitor in the interests of his company, which is supplying the needs of some of the large Western power projects.

D. C. Henny, consulting engineer of the Reclamation Service, stopped in San Francisco recently on his return trip to Portland. Mr. Henny has been attending a business conference in Chicago.

C. E. Grunsky, San Francisco consulting engineer, has returned from Chicago where he attended the meeting of the board of directors of the American Association of Civil Engineers.

W. L. Goodwin, who is now on his way to California, will deliver addresses in San Francisco on May 5th and in Los Angeles May 7th on the Goodwin Plan. He intends to spend the month of July on a vacation in the mountains of California. **Samuel Adams Chase** will also address both meetings.

R. P. Askue has severed his connection with the publicity department of the National Lamp Works to go into agency work with headquarters at Cleveland, Ohio. Mr. Askue had been with the National Lamp Works for several years, prior to which he was advertising manager for the Ivanhoe Regent Works of General Electric Company.

I. J. Shulsinger is now advertising manager of the National Metal Molding Company of Pittsburgh. Mr. Shulsinger, who has had several years' experience in electrical advertising, is considered an authority on the merchandising and advertising of electrical appliances and supplies. He was formerly with the McGraw-Hill Company, resigning this connection to take up his new work. While with McGraw-Hill he gave special attention to the preparation of advertising campaigns for advertisers in electrical merchandising. He was also at one time a member of the advertising department of the Western Electric Company.

W. S. Van Winkle has been elected president and general manager of the Bay Point Electric Light & Power Company of Bay Point, Cal. Mr. Van Winkle graduated from the University of California with the class of 1912 and for some years was in the commercial department of the Great Western Power Company with headquarters in Oakland, Cal. For the past two years and a half Mr. Van Winkle has been actively engaged in engineering and managerial matters for the Bay Point Light & Power Company and as a consequence this new promotion comes as no unexpected surprise. While this company is a small one, yet it is believed that the opportunities for vision and executive control will grow with the live and active community in which this company is located.

OBITUARY

Theodore N. Vail, chairman of the board of directors of the American Telephone and Telegraph Company, died at Johns Hopkins Hospital recently. Mr. Vail was the head of the largest telephone system in the world. He was from the first the genius that promoted the popular use of the telephone, the first man to establish long-distance communication by telephone, and when past 70 years of age he was still the initiative head of a system that numbered 9,000,000 telephone subscribers and represented an investment of a billion and a half dollars.

Meeting Notices for Electrical Men

(Never before has the West been able to announce a list of electrical meetings such as the ones which are scheduled here for the month of May. Plans for the A. I. E. E. convention, the convention of the National Supply Jobbers' Association, the Foreign Trade convention and the N. E. L. A. conventions, make the following pages of greater interest than ever before to every man of the electrical industry.—The Editor.)

Meeting of San Jose Contractors and Dealers

At the regular April meeting of the Electrical Contractors and Dealers' Association of San Jose, delegates were appointed to attend the meeting of the state association at Visalia, on April 24, and plans were discussed with the idea of securing a meeting of the California State Association of Electrical Contractors and Dealers in San Jose in the near future. Mr. R. L. Smith, field representative of the California Electrical Cooperative Campaign in the bay district, was introduced to the members and gave them a short talk on what the campaign is trying to do for them and offered his assistance in any way possible. He finished with a plea for a more hearty cooperation between the contractors and the field representatives.

It was unanimously decided by the association to install the best fixtures possible on every job, and always to install fixtures suited to the particular lighting conditions at hand. The meeting was well attended. The members showed a great interest in all of the proceedings and evidenced a desire to make the very most out of their association and to raise the standard of their business in every possible way.

Electrical Day at the Los Angeles Ad Club

A recent meeting of the Los Angeles Advertising Club was made the occasion for the reception of members of the Electrical Cooperative League who have discontinued their separate organization and have formed an Electrical Section with the advertising men.

K. E. Van Kuran, district manager for the Westinghouse Company, acted as chairman of the day and was introduced by Ralph B. Clapp, formerly president of the Electrical Cooperative League. Among the guests of honor were J. G. Pomeroy, manufacturers' agent; Wm. Baurhyte of the Los Angeles Gas and Electric Corporation; H. L. Harper of the Western Electric Company, and Messrs. G. C. Ward, A. N. Kemp and S. M. Kennedy of the Southern California Edison Company.

R. H. Ballard, general manager of the Southern California Edison Company and president of the National Electric Light Association, spoke on "Electrical Development, the Future of California," stating in part:

"Our ability indefinitely to increase our own productiveness is the greatest asset which we have to advertise. The electricity generated from the gravity waters as they rush down from the high altitudes of our mountain watersheds is the force behind our ability to bring hundreds of thousands of acres of negligible lands under intensive cultivation and to make the southwest a great and permanent manufacturing center, because we can guarantee that our power cost will always be lower than that of any other section of the country and will not be jeopardized by the diminishing supply of coal and oil, which is already menacing other parts of the country.

"In California there is about one million horsepower of hydroelectric energy developed. Six million horsepower is waiting to be developed from the waters of the state and there is a market for every kilowatt-hour that can be produced."

Frank C. Tyrrell, a local attorney, spoke in place of Robert Sibley, editor of the Journal of Electricity, who had been scheduled to present the subject, "$250,000,000—How You Will Help Do It," but was unable to attend the meeting. Mr. Tyrrell gave a powerful address, showing how industry as a whole must support the program of electrical development in the state to insure our continued prosperity.

Electrical Credit Association

At the fifteenth annual meeting and dinner of the Electrical Credit Association of the Pacific Coast, held in San Francisco on April 15th, R. J. Holterman, manager of the Holabird Electrical Company, was elected the new president. The other officers elected were: J. J. O'Reilly, first vice-president; H. C. Chapman, second vice-president; S. W. Murray, third vice-president; A. H. Elliot, secretary-treasurer; John Bray, H. J. Zweifel, R. J. Holterman, F. A. Morton, J. H. Levenson, executive committee; S. B. Anderson, representative to the National Electric Light Association.

The retiring president, H. J. Zweifel, presided during the business session, which consisted of reports from the auditing committee, C. W. Goodwin, Jr.; report of secretary-treasurer, A. H. Elliot; and of the nominating committee, J. T. Gates. The toastmaster, A. H. Elliot, introduced the following speakers: L. J. Brown, assistant sales manager, Western Electric Company; R. J. Holterman, manager Holabird Electrical Company; C. W. Banta, vice-president Wells Fargo Nevada National Bank; C. E. Listenwalter, Listenwalter and Gough, Inc., Los Angeles; and F. P. Vose, secretary National Credit Association.

There was a spirit of the greatest optimism prevalent at the meeting, which concludes the eighteenth year of the existence of this association. At the present time there are thirty-two full members and six half-members of the association.

Power Administrator Addresses Electrical Development League

The optimistic note struck by H. G. Butler, power administrator of the California Railroad Commission, at the regular Monday noon meeting at the Palace Hotel of the San Francisco Electrical Development League on April 12, brought encouragement to the men of the industry and the Purchasing Agents Association, who were their guests. After being

BUILDERS OF THE WEST — LXXVI

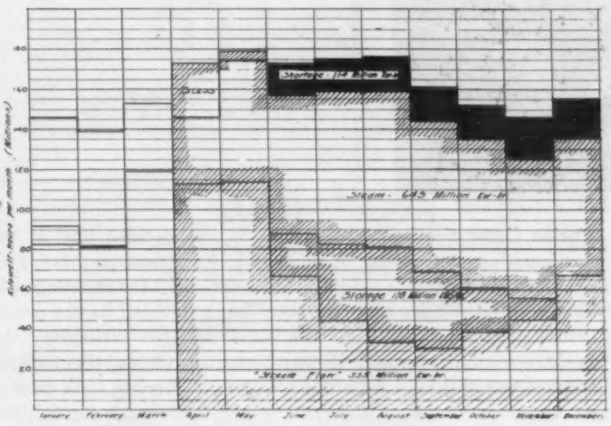
DR. DAVID P. BARROWS

The spirit of the educational centers of the far West which in its message of cheer and inspiration has done so much to cement Oriental friendships is closely allied with the purposes of the Foreign Trade Convention soon to open its sessions in San Francisco. To Dr. David P. Barrows, president of the University of California—with its ten thousand students the largest institution of its kind in the world—this issue of the Journal of Electricity is affectionately dedicated in lasting appreciation of his service to the West in giving to the young an inspiration and confidence for the future, and for his effective service in pointing out to them what the West has in its native values to contribute to the upbuilding of humankind.

formally introduced by Mr. J. E. Woodbridge, consulting engineer for the Southern Sierras Power Company, Mr. Butler began an analysis of the power situation as it now stands and produced a chart which showed the probable demand, the available power from steam and hydro plants in the state, with a shortage shown of 114,000,000 kw-hr. To meet the present power and water situation Mr. Butler said, in part:

"No definite plans for this year have as yet been made. The plans to be made will depend on the conditions when it becomes necessary to use stored water. All that has been done so far is to prepare to secure as much power as possible, to attempt to keep the rice load within bounds and to urge farmers, through associations and organizations, to plan to do their irrigating at night, as far as possible, after May first.

"Stored water will be used to equalize the shortage over the seven months during which the shortage will prevail. This method of using stored water also works out best for irrigation as the water will be withdrawn when needed for crops. The shortage, based on the estimated demand, which is from 5% to 8% greater than for the corresponding



PROBABLE POWER SHORTAGE

Chart used by Power Administrator H. G. Butler to show probable shortage. The figures on this chart, Mr. Butler pointed out, are only approximate as late spring rains or early fall rains would change all of them.

months last year, will be 114,000,000 kw-hr. for seven months, or about ten per cent.

"In the northern part of the state this is the third consecutive dry year. It is difficult to estimate the stream flow, but a closer estimate may be made of the stream flow which will be important. Indications are that the Pacific Gas & Electric Company will have 10,000,000 kw-hr. more than last year but will not fill its upper reservoirs. Lake Almanor of the Great Western Power Company will be only forty per cent full. Steam is a very uncertain factor. To carry out their part of the program as much as 77,000,000 kw-hr. per month will have to be generated, while the best the same plants have ever done before was 64,000,000 kw-hr. in August of last year.

"The precipitation in the southern half of the state has been nearer normal than in the north and the supply of energy is proportionally greater. The San Joaquin Corporation has been face to face with a power shortage since 1918 and has not taken on an extensive load, and the Southern California Edison Company has also been careful on new business. The watersheds of the hydro plants are higher than those of the north and it is more difficult to estimate what the water supply will be, but I firmly believe that it is safe to say that if the agricultural and other loads can be shifted from day to night, no extensive new load taken on, and the resources are carefully husbanded, it may be unnecessary to place power restrictions on the south."

Pointing out eleven big construction projects that are actually under way, with a capacity of 208,000 kw., Mr. Butler went on to say:

"All but 10,000 kw. of this, or 198,000 kw., will be available before the low water next season and there are other plants in contemplation which could be finished by this time. Of this 76,500 kw. is in the northern district and the interconnection between the South and North is too light to permit of an interchange of power sufficient to make the new plants of the South available for the North. Still, with a normal supply of water there should be no power shortage next year. The more distant future is safe if the power companies definitely realize, and I think they do, that they must think in terms of hundreds of thousands of kilowatts and tens of millions of dollars. But even so it will be a severe strain to finance and build the power plants necessary to make our water resources available to the manufacturers of the East, who will seek them in increasing numbers as the fuels become more and more exhausted and more and more expensive. The Goodyear Rubber Company, in my opinion, is only the advance guard of those manufacturers, and that company alone, when it reaches full completion, will take 100,000,000 kw-hr. per year, or three and one-third per cent of the total 1919 output of practically all the plants on the Pacific Coast between Oregon and Mexico.

"When the proposed interconnection is made in the very near future, there is no system of interconnected companies in the world which will compare with it in magnitude. Nearly 100 plants will be tributary to it and consumers who use over 10,000,000 kw-hr. daily during the summer will be supplied from it. The output of these plants in 1919 was 3,300,000,000 kilowatt-hours."

Convention in Texas

The annual convention of the Southwestern Electrical and Gas Association will be held in Galveston, Texas, May 15th. Several matters of importance, including action by the electrical section of the association on the question of joining the Southwestern Geographic Division of the National Electric Light Association, will come up at the convention. Executive Manager M. H. Aylesworth and Treasurer H. C. Abell of the association expect to attend and address the convention on the work of the N. E. L. A. and the advantages to be gained by membership therein.

A. I. E. E., Pacific Coast Convention

The Pacific Coast convention of the American Institute of Electrical Engineers will be held in Portland, Oregon, July 21, 22 and 23. The Multnomah Hotel will be the convention headquarters and the business sessions will be held in one of its ballrooms.

The morning session on Wednesday, July 21, will be devoted to general business, and to a paper by W. D. Peasley of the Jeffrey-DeWitt Insulator Company on "High Tension Insulator Design." At the afternoon session a paper by Professor Harris J. Ryan of Stanford University will be presented. This will deal with the electrical essentials required for the use of standard cap and pin type insulators for supporting long 220-kv. lines. A paper on "Power Factor Correction," by some member of the engineering staff of the General Electric Company, will also be presented at this time.

On Thursday morning Mr. Beeuwkes, electrical engineer of the Chicago, Milwaukee & St. Paul Railway, will read a paper on "Railway Electrification." At the afternoon session a paper on "Hog Fuel, Fuel Oil and Pulverized Coal" will be presented by some member of the engineering staff of the Charles C. Moore & Company. In the evening the guests will be taken for an automobile tour over some of Portland's scenic boulevards.

A paper by some member of the engineering staff of the Pacific Telephone & Telegraph Company, on "Bridge Methods for Alternating Current Measurements," and a paper by the chief engineer of the Maryland Pressed Steel Company, on the use of special steel in pressed steel transmission line fittings, will be presented Friday morning. Friday afternoon will be devoted to a golf tournament, competing for a

Lobby of the Multnomah Hotel, Portland, Oregon, where the Pacific Coast A. I. E. E. convention will be held, July 21-23. Five important business sessions will be held in the ballrooms of this hotel.

Shephard's Dell on the Columbia River Highway, which will be seen during one of the trips planned in connection with the Pacific Coast Section A. I. E. E. Convention. A number of tours have been included in the convention schedule so that every delegate will have an opportunity to see all points of interest around Portland, including many of the big hydroelectric plants of the Northwest.

cup offered by Vice-President Fisken. For those not interested in golf, a trip up Columbia River Highway has been arranged. Both parties are to meet in the evening for dinner at the Crown Point Chalet.

Saturday, July 24, will be devoted to trips taking in various points of interest in and around Portland. These trips will probably include the hydroelectric plants of the Portland Railway, Light and Power Company and the Northwestern Electric Company, the new steam generating station of the Northwestern Electric Company, the Inman-Poulsen sawmill, the new municipal terminal and grain elevator at St. Johns, the electric brass furnaces of the Oregon Brass Company, and various other points of interest.

The foregoing, of course, is a tentative program and subject to change. Nevertheless all of the papers mentioned have been definitely promised and all plans indicate that great things in the realm of work and play are in store.

President Barrows Addresses Development League

At the regular meeting of the San Francisco Electrical Development League, at the Palace Hotel on April 26, President David P. Barrows of the University of California addressed the meeting on the subject of Mexico. Mr. Barrows was introduced by Dr. Thomas Addison, Pacific Coast manager of the General Electric Company.

One of the features of the meeting was a large table at right angles to the speakers' table, at which the alumni of the University of California sat and during the meal broke out into the old songs and cheers of their alma mater. Another innovation was the appointment of a Chairman of Fines. To Garnett Young, of Garnett Young & Company, fell the honor of being the first to hold this office.

In speaking of Mexico, Dr. Barrows dwelt on the economic possibilities of the country and laid most of the blame for the present unsettled conditions to the impossibility of securing a fair election. He brought out the fact that the world needs the resources of Mexico, especially at the present time when the peoples of Europe are in need of many of the products which Mexico could supply. Dr. Barrows explained the change in the policy of the United States from the time of the Boxer uprising in China, when the United States rushed in to extricate its citizens from Pekin, to the present policy of the administration towards those Americans who are in Mexico today.

Papers Committee Meeting

At the recent meeting of the Papers Committee of the Pacific Coast Section, N. E. L. A., it was decided that at the forthcoming convention to be held in Pasadena on May 17th there would be but a single day's session. This meeting will be opened at 9 a.m., the first hour being devoted to the president's address, reports of the secretary, the treasurer, the various committees, etc. From 10 a.m. to 12 m. the various committees will hold separate sessions to discuss such papers as appeared to be of interest to the individual committees and not of particular interest to general membership.

At 1:30 p.m. there will be a general session to discuss Mr. Woodbridge's paper on Railway Electrification, and such other papers as the time will permit. At 4:30 p.m. the closing business session will be held. Thus it will be seen that there will be but two hours for the discussion of engineering papers.

Consideration was given to the selection of subjects to be discussed at the engineering session. The paper by Mr. Armstrong on "Relay Protective Systems" was suggested. In addition to this paper, it has been suggested that some time be devoted to a discussion of the question of "Method of Improving Power Factor of Consumer's Apparatus by Rate Schedules."

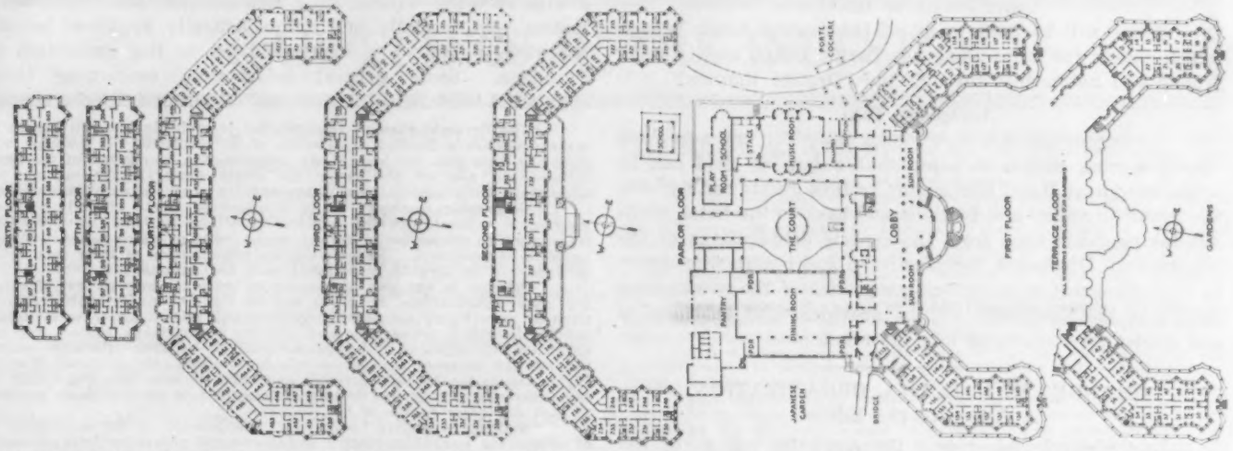
FOREIGN TRADE ADDRESSES

Among interesting addresses listed for the Foreign Trade Convention, San Francisco, May 12-15, are the following:

Sticker used by the Foreign Trade Councils to advertise the 1920 Convention.

"Foreign Exchange": Fred I. Kent, vice-president Bankers' Trust Company.
"Port and Terminal Facilities": B. F. Creson, Jr., New York-New Jersey.
"The Relation of Our Productive Capacity to Our Foreign Trade": James A. Farrell, president U. S. Steel Corporation.
"Foreign Trade in Railway Supplies": Frank Noxen, Railway Supply Association.
"The Service of the Business Press": James H. McGraw, The McGraw-Hill Corporation.
"The Importance of Foreign Credits": Henry S. McKee, vice-president Merchants National Bank, Los Angeles.
"Fuel Oil and Foreign Trade": A. C. Bedford, Standard Oil Co. of New Jersey.
"Survey of New Markets": E. Wilhelmi Droosten, the Robbins and Myers Company.
"Commercial Intercourse with China": John Foord, American Asiatic Association.

These are only a few items from a program which is of the greatest interest to the electrical industry as well as to the country as a whole.



Above is the floor plan of the Hotel Huntington, Pasadena, which is to be the headquarters of the N. E. L. A. Convention. The regular joint sessions will be held in the Music Room on the first floor while special sessions will be held in several smaller rooms. It is rumored that at various unexpected times bewitching dancers and serenaders will appear in the sunken Japanese gardens which surround the hotel.

N. E. L. A. Conventions—May 17th-22nd

(Those who have already planned to attend the N. E. L. A. Convention will be interested in the following announcements concerning transportation, registration and N. E. L. A. organization plans which are to be considered in Pasadena, and those who have not already planned to attend convention will perhaps be spurred on to make the convention decision by this page. —The Editor.)

CONVENTION ENTERTAINMENT FEATURES

Charlie Murray, the Mack Sennett comedian of Celtic persuasiveness, has accepted the responsibility of being master of ceremonies at La Fiesta de Electra, which will be the culminating entertainment feature of the N. E. L. A. Convention to be held at the Hotel Maryland on Friday night, May 21st.

Charlie Murray, who is to be the charming toastmaster of La Fiesta de Electra.

On the great staircase leading into the lobby of the hotel there will be novelty pictures and performances appropriate to the festive occasion and Mr. Murray stakes his professional reputation reputation in reiterating the slogan of the old time showman that it will be the "greatest show on earth."

It is expected that upwards of three thousand guests will be entertained at the Fiesta de Electra and at least ten novelty acts will be produced by motion picture stars and comedians who are the makers of spontaneous mirth and photo drama thrills of the world.

To make it possible for the delegates who visit the convention of the National Electric Light Association at Pasadena, May 18th to 21st, to see every feature of Southern California life within the shortest space of time, with the greatest possible convenience, and by special arrangements such as are not obtainable by the individual tourist, is the aim of Entertainment Chairman W. L. Frost.

Santa Catalina Island

He has completed plans for a trip to Santa Catalina Island, the magic island of the Pacific, which lies twenty-six miles from the mainland, and is the mecca of pleasure seekers and fishermen the world over. A large new steamer will be put into service just previous to the convention, and Chairman Frost anticipates that enough of the visitors will wish to make the Catalina trip so that the new boat can be chartered for their exclusive use.

Santa Catalina Island is the fishing grounds of the tuna, the gamest fish that swims, and it is the home of the Tuna Club, which has a membership extending all over the world.

Filmland

Another of the trips already arranged is one through "Filmland," or the motion picture studios, some sixty of which are located within easy ride of Hotel Huntington. These studios are ordinarily closed to the public, as the producers figure that the delay caused to the working of actors and camera men figures fifty dollars net loss for each visitor who is admitted. The entertainment committee has overcome this obstacle and has arranged that the delegates be shown through the studios and be permitted to see the actual stage work upon the sets, and learn the part electricity plays in the art of motion picture photography. Among the studios which will welcome N. E. L. A. delegates are the Lasky, the Metro, the Universal, the Charley Chaplin, the Goldwyn and the Ince studios, and the studio where Mary Pickford and Douglas Fairbanks stand before the camera.

If you are planning a vacation, Take it at Pasadena, May 17-22

If you have no time for a vacation, Come work with us for the good of the Industry.

If you are wondering about the future of the public utility under regulation, Hear Mr. Carl Jackson, chairman of the Wisconsin Railroad Commission, on "Trend of Regulation," and Mr. E. O. Edgerton, President of the California Railroad Commission, on "Reward for Efficiency."

Are you familiar with the plans of your national association to bring about a better understanding between the Regulator, the Public and the Public Utility?

If not, Come to Pasadena and take part in the discussion of executive dealing with this important question.

MAY 17TH TO 22ND

Other Points of Interest

There will be trips to all of the famous beach resorts which extend for miles along the Pacific Coast, and trips by trolley and automobile through the "Orange Empire."

Aeroplane Taxi

Arrangements are now under way for an aeroplane "taxi" service, and it is hoped that a landing field can be established near Hotel Huntington so that guests can fly over the beautiful valley and foothills and back to the hotel, without taking much time from the serious deliberations of the convention. Engineers, technical men and others who desire to visit the great hydroelectric properties of the power companies of the Southwest will be provided with automobiles and guides for excursions into the mountains.

CHANGES IN N. E. L. A. ORGANIZATION
A Letter to the Editor

Last night I looked over the April 1st edition of the Journal, and was so impressed with it, that I am constrained to write you and extend my congratulations as well as my official and personal appreciation and gratitude for the manner in which you are handling the National Electric Light Association Conventions. The two pages devoted to the National Electric Light Association are very impressive.

Under the direction of Mr. M. H. Aylesworth, executive manager, the headquarters office of the association has been thoroughly reorganized, and some new men have been brought in. They have now a departmental organization very similar in character to the organization of public utility companies. The general office routine is in charge of Mr. S. A. Sewall, acting secretary; all committee work in charge of the committee secretary, Mr. A. J. Marshall; a service department has been organized under Fred H. Herbert, who is making himself very useful to member companies; the rate research department has been moved to New York, and under the direction of Mr. Herbert has expanded to be in fact a regular rate bureau for the assistance of member companies; the department of publicity is under supervision of Mr. George L. Oxley, director of publicity; and an engineering department is being organized and we will soon be able to announce the addition to our forces of a prominent engineer to take charge of this department and handle for the association such matters as inductive interference, electrolysis, Bureau of Standards safety codes and rulings.

Our committee on reorganization, under the chairmanship of Vice-President Frank W. Smith, New York, and our committee on constitution and by-laws, under the chairmanship of Mr. Wm. C. L. Eglin, Philadelphia, presented to the executive committee meeting held in New York on the 8th of this month, proposed amendments to the constitution, which are in fact the writing of a new constitution. The whole matter was formally and enthusiastically approved by the executive committee for presentation to the convention at Pasadena. Some general information concerning these changes, I think, will interest you. Quoting from the report:

"**The Pyramid Plan of Organization** is probably too well known to make necessary a detailed explanation of its principles. It probably will suffice to state that the base of the pyramid—the foundation of the association—will rest on and cover the entire country, thus making the association truly national and democratic in scope, thought and action.

"**Geographic Sections:** It is proposed to create officially thirteen geographic sections with the constitution of the National Electric Light Association so framed as to permit of any revision which experience may prove to be necessary. The activities and organization of these geographic sections will in turn be coordinated with the national.

"Without in any way attempting to usurp the prerogatives of existing state organizations, an effort will be made to assist such organizations to more highly developed, organized and related activities by establishing through a sympathetic and effective organization, contact and cooperation with adjacent state organizations. By working with and clearing through the proposed thirteen geographic sections, the National Electric Light Association becomes actually and truly national and democratic in scope, assuring prompt and intelligent treatment of every problem peculiar to each and every section of the country.

"**National Executive Committee:** Membership of the association is of course the controlling factor and elects the governing body, namely, the national executive committee, consisting of the president, retiring president, four vice-presidents, treasurer, and presiding officers or other duly accredited representatives of the proposed thirteen geographic sections, the chairman of each of the proposed national sections, and nine members at large, six of whom shall be chosen from Class A or Class B members and three from Class D or Class E members. This is adopting nationally the change made in the Pacific Coast Section at Riverside and permits of representation on the executive committee of others in the industry besides central station companies.

"**An entirely new feature:** public relations national section. The structure, personnel and method of operation of this proposed section is identical with the other proposed three national sections (commercial, technical and accounting), excepting that the public relations national section in addition to its representation on the national executive committee will have definite contact with the national public policy committee by means of seven members of the executive committee of the public relations national section serving on the national public policy committee, which seven members will be recommended by the chairman of the public relations national section, endorsed by the chairman of the national public policy committee and approved by the national executive committee.

"In order to provide machinery for the operation of the reorganization plan as previously broadly described, there is in course of preparation a 'Guide' for the operation of geographic sections, state organizations and company sections, intended not as a cut-and-dried plan of procedure, nor a codification of rules and regulations, but merely an orderly arrangement of notes and suggestions which indicate a way to successfully conduct such operations without entailing any loss of time or effort, and thereby promoting cooperation, coordination and efficiency in the work of the entire association. These 'Guides' are purely suggestive in character and may be modified (insofar as such modifications do not conflict with the constitution of the National Electric Light Association) to suit the requirements of any geographic section, state organization or company section. Copies of this 'Guide' will be available upon request by geographic section, state organization or company section officials.

"The object sought in the reorganization proposed is to provide thorough and complete democratic representation of all parts of the country and all phases of the electrical industry in the management and activities of the National Electric Light Association, and to so relate all interests and to so systematically coordinate all activities involved, that the results desired will be secured with the minimum expenditure of time, money and effort—the entire electrical industry going forward in unison."

I received this morning the following telegram from the Executive Committee:

"At a very successful meeting today we fully discussed and recommended the new constitution along the lines of the policies inaugurated by you and adjourned to meet you at Pasadena at the national convention on May eighteenth."

R. H. BALLARD.

In 1911 Del Monte was the scene of the convention of the Electrical Supply Jobbers' Association and at that time the above records of the delebe held this year, May 12-14. A comparison of fashions then and now cannot

HAPPENINGS IN THE INDUSTRY

COLORADO RIVER IS CONVENTION SUBJECT

For the purpose of seriously studying the possibilities of the Colorado river drainage basin and taking definite action along practicable lines, the League of the Southwest held a convention in Los Angeles April first to third. The importance of the subject is indicated by the number of prominent men attending and the interest shown in purely technical topics presented from time to time.

No less than fifty men of national reputation attended the meeting and the list of speakers included Governor Stephens of California; Governor Campbell of Arizona; Governor Davis of Idaho; Governor Larrazolos of New Mexico; Governor Bamburger of Utah; W. J. Bryan; Miss Helen Taft, daughter of former President Taft and acting president of Bryn Mawr; Senator Owen of Oklahoma; E. C. La Rue, government engineer and an authority on the Colorado; John T. Whistler, engineering adviser of the Federal Farm Loan Bureau; C. E. Grunsky, former Panama Canal commissioner; F. E. Weymouth, chief of construction of the United States Reclamation Service; Victor E. Keyes, attorney-general of Colorado; E. O. McCormick, vice-president of the Southern Pacific and Dr. Kleinsmid, president of the University of Arizona and president of the League.

The watershed feeding the Colorado river includes nearly all of the state of Arizona, about one-half of Utah, a large portion of Colorado and substantial parts of Wyoming, Nevada and New Mexico. A comparatively small strip in California is also included. This immense basin drains 265,000 sq. mi. and dominates over six million irrigable acres.

At the final meeting of the convention Gov. Campbell of Arizona was elected President of the League of the Southwest, Frank A. Gesell, vice-president and Arnold Kruckman, secretary.

The convention closed with the unanimous adoption of the resolutions drafted by a committee headed by Judge Richard E. Sloan of Arizona. The resolutions are given below in full as they represent a positive step which may be of tremendous importance to the future of the Pacific Coast and, further, because they embody definite plans which will be of interest to readers of the Journal of Electricity:—

"The Convention of the League of the Southwest, composed of delegates from the States of California, Colorado, Arizona, New Mexico, Nevada, Utah, Wyoming and Idaho, in conjunction with engineers, scientists and men eminent in the affairs of the whole nation, assembled in the city of Los Angeles, Cal., April 1, 2 and 3, 1920, view the plan of control and development of the Colorado River, as outlined by the Reclamation Service of the United States and the able papers presented to this convention, as one most essential to the growth and development of the West, and as furnishing means for the future prosperity of a great many citizens of the United States of this and future generations. The vastness of the project is such that many years will be required before it can be brought to completion in all its details.

"Whereas, is has been shown by the investigations of the government that a great dam may be constructed at or near Boulder Canyon on the Colorado river, as proposed by ex-Secretary Lane, adequate to control the destructive floods of the Colorado river and of sufficient capacity to supply water for the irrigation of 1,500,000 acres of land in addition to that now under irrigation, with a productive capacity of $150,000,000 in wealth annually, with a livelihood for over 1,000,000 of our population;

"And whereas, the power available from this reservoir will be sufficient to supply the necessary electrical energy for large portions of the states of California, Utah, Nevada, Colorado and Arizona;

"And whereas, the storage of water at this site will not in any way interfere with the further development of the river in the upper portions of its drainage basin;

"Now therefore be it resolved: That the United States Reclamation Service be requested and urged to proceed with diligence with its investigations of this site, with a view to its very prompt construction;

"Resolved: That Congress is hereby requested to appropriate the sum of $50,000 for the use of the Reclamation Service in completing the investigation of the Boulder Canyon reservoir site, and that such appropriation be made available at once.

"And whereas, the withdrawal from entry of the Ouray reservoir sites in Utah, which would inundate and render useless 250,000 acres of land, including several small towns and 20,000 acres of Indian allotments, and which prevents the building of a through line of railroad from Denver to Salt Lake City, that is vital to the interest of northeastern Utah and northwestern Colorado, this reservoir site should be abandoned, that the essential right of way may be granted and development assured to one of the largest and richest mineral and agricultural sections of the Colorado basin;

"Now therefore be it resolved: That we recommend the abandonment of the Ouray reservoir site unless it shall be shown that such site is absolutely essential to the general development of the Colorado river.

"Be it further resolved: That it is the sense of this convention that private projects which do not conflict with the proposed general plan of the Colorado river should be permitted to proceed with the fullest cooperation of the government, and that a liberal policy should be adopted toward such private enterprises;

"Be it further resolved: That in carrying out the plans of the Colorado river project, due consideration should be given entrymen and settlers who have been hindered in their efforts to obtain water for their claims, and that they should be given such reasonable time as may be necessary to complete their proofs.

"We further recommend that no public lands be withdrawn from entry, or if already withdrawn, that no such lands be withheld from entry and settlement, except those proved essential for the project.

"It is further resolved that the President of the United States be requested to take the proper steps, through diplomatic channels to secure—if possible—the establishment of joint control, by the governments of Mexico and the United States, of the waters of the Colorado river diverted by natural conditions through a portion of the republic of Mexico and again entering the United States, to the end that all levees, irrigation works and canals, constructed for the control of such waters may be properly maintained and protected;

"Be it further resolved: That the governors of the states represented in the League of the Southwest constitute a permanent committee and as such be empowered to take such action as they may deem necessary and proper to make effective the suggestions embodied in these resolutions; and for that and the general purposes of the league, they are severally requested to obtain, if it be possible, such financial aid as may be needed from their respective states.

"Whereas, definite results in pooling the water resources of the Colorado basin and arranging a working program can only come through full presentation and study of all engineering data pertaining to irrigable acres, reservoir sites, power sites and water supply of each state:

"Resolved: That to this end a permanent engineering commission should be formed consisting of the state engineers of the several states and engineers of the United States Reclamation Service to study the basin as a whole and prepare a comprehensive plan for immediate action and early development."

gates were taken. Undoubtedly many of these same members of the association will be present at the second Del Monte convention which is to but be interesting to any member with a sense of humor or an eye for progress.

NEW ELECTRICAL DEVELOPMENT

(The completion of a new $100,000 steam plant, appropriations for city lighting purposes and plans for the construction of a large reservoir are reported among Northwest items. Hydroelectric development in Shasta, Lassen and Modoc counties is included among other news of the Pacific Central district, while bond election reports come from both Arizona and Southern California. A number of items concerning public utility activities are among those from the Intermountain district.—The Editor.)

THE PACIFIC NORTHWEST

SEATTLE, WASH.—Ordinances have been introduced in the city council appropriating $8000 and $150,000 for the city lighting department.

SALEM, ORE.—Oregon Electric Company will make improvements in the city to cost $10,000.

SEATTLE, WASH.—Stone & Webster division of construction and engineering has closed its Seattle office and Messrs. Shannon and Roberts, members of the force, are awaiting orders.

BEND, ORE.—The Bend Water, Light and Power Company has completed entirely successful tests of their new one thousand-kilowatt $100,000 steam plant here.

SEATTLE, WASH.—The city of Seattle has officially approved the new sixteen-mile steel pipe line from Molasses Creek to Volunteer Park reservoir. The cost is estimated at three million dollars.

SALEM, ORE.—The Oregon Pulp and Paper Company has purchased from the Ladd interests of Portland, the north power site on the North Mill Creek for one hundred thousand dollars. The power is to be used in the manufacture of paper.

COUPEVILLE, WASH.—W. C. Cheney, who built and put in the electric light plant here in the fall of 1915, has sold the plant to Coates & Son who will operate it from their works at Prairie Center on Ebeys Prairie. The new owners are putting in new poles for various customers on the Prairie.

TACOMA, WASH.—St. Paul & Tacoma Lumber Company have ordered a 2500-kw. steam turbine unit through the Seattle office of the Allis-Chalmers Manufacturing Company, which will be used in completing the electrification of its mills at Tacoma. A 1000-kw. machine has been in operation at the mills for some time.

SEATTLE, WASH.—Nepage, McKenny Company, electrical engineers, contractors and manufacture, Armour Building, Seattle, report considerable activity in their lines. Among the contracts recently secured are: complete installation of electrical equipment in the addition being made to the Arcade Building, Seattle; Rhodes Brothers Building at Third and Virginia streets; new building of the Gair Realty Company at Westlake & Republican streets, also the new building of the same company at East Union and Broadway, to be occupied by Western Motors Company. Installation of complete electrical equipment in the new store building of E. S. Keith, Bremerton, Washington, will also be made.

SALEM, ORE.—Application for permits to construct a reservoir and divert large quantities of water for development of hydroelectric power have been filed by J. G. Kelley, 516 Chamber of Commerce Building, Portland. The site of the reservoir and power house will be in the Santiam National Forest, Oregon. Work is not anticipated in the near future. Marion Lake will be enlarged for the storage of 38,155 acre-feet of water, according to plans filed, and the dam will be 75 feet high, 500 feet long at the top and 50 feet at the bottom. A 30-inch steel pipe is to be placed through the base of the dam and there will be a tunnel up to ten feet in diameter, with 96-inch steel pipe at the intake, estimated cost to be $125,000. The development of 26,636 theoretical horsepower is contemplated from the diversion of 160 second-feet of water from Marion Lake, Puzzle Creek and Whiskey Creek. There will be a canal system of wood stave pipe seven feet in diameter, forebay, surge reservoir, penstock and power house, all of which will cost $1,795,000. Applicant also asks permission to divert 600 second-feet of water from north fork of Santiam river for developing 29,000 horsepower. Construction here contemplated is estimated to cost $2,000,000 and will include a gravity type dam of reinforced concrete, a canal eleven feet wide, forebay, penstock and power houses. No mention of the probable date of beginning or completing construction is made.

THE PACIFIC CENTRAL DISTRICT

SAN FRANCISCO, CAL.—The second contract for six gates for the Hetch-Hetchy dam was awarded by the board of public works to William Crap & Sons at $173,000.

ALAMEDA, CAL.—The contract has been let for the construction of the new substation on Webster street and Atlantic avenue by the Municipal Electric Light Plant. The station will cost $60,000.

PETALUMA, CAL.—The city council opened bids for installing the conduits for electroliers on Main and Third streets and awarded the contract to the lowest bidder, Bauer & Baugh, at $1,515.

BELDEN, CAL.—Work on the development project of the Great Western Power Company near Howell is virtually at a standstill by reason of most of the crew employed quitting work without notice. Between 600 and 800 men are involved.

ANDERSON, CAL.—At a meeting of the directors of the Anderson-Cottonwood Irrigation District, May 8th, was the date set for the voting of a new bond issue of $200,000 to complete the irrigation district and to adequately drain the system.

ANTIOCH, CAL.—Construction of a mammoth restraining dam across Carquinez Straits from Bullshead Point, near Martinez, to Army Point, Solano county, to prevent salt water from encroaching on rich agricultural lands in this district is being suggested by farmers and its promotion is being seriously considered.

RICHMOND, CAL.—By May 1 the big tunnel aqueduct of the East Bay Water Company, leading from the San Pablo Canyon reservoir through the hills to the western side above San Pablo Avenue, will be ready for operation, according to statements of officials of that corporation.

REDDING, CAL.—An all-steel tower line will connect the Pacific Gas & Electric Company's power development on Pitt river with San Francisco bay. A crew of surveyors arrived to begin mapping out the line. Power development work just starting in Shasta county will cost $3,000,000.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company plans the expenditure of $15,000,000 for improvements in 1920. Of this $3,170,000 is to go to Alameda county district. A new gas generator set and improvements at Station B call for $215,000. A 2,000,000-ft. gas holder is to be built in Berkeley, and $45,450 has been authorized to construct a new 11-kv. line from First and Grove to Station D, Fifty-first and Shattuck. It will be a 4-0 cable underground to Twenty-seventh and Grove streets.

OROVILLE, CAL.—Delegates representing nine irrigation districts in northern California, comprising 282,000 acres of land, declared for the full development of water in the northern part of the state for northern California land, and organized the Association of Northern California Districts. Officers will be elected and by-laws adopted at a meeting to be held in this city May 8th.

OAKDALE, CAL.—The Oakdale irrigation district will be forced to condemn the site for its proposed $2,000,000 dam, the district and the Calaveras Copper Company, owner of the Melones dam, being far apart on their negotiations, which have been broken off. The copper company asks $250,000 for its site alone. The irrigation district has offered $6,000. The company also wants certain concessions.

WOODLAND, CAL.—Work was started on the construction of an $80,000 steam power plant by Reclamation District 108 at Knights Landing. The plant will supply power for irrigation in the Wilkins Slough and Boyer's Bend districts. The electricity will be carried over the wires of the Pacific Gas & Electric Company. The plant is to be installed on account of the power shortage. Twenty thousand acres are in rice in the district this year as against 7,000 acres last year.

VALLEJO, CAL.—Commissioner R. O. Pierce returned from an inspection of a watter supply north of Napa, just this side of Mount George, which he believes will eclipse any proposition thus far inspected by Vallejo. Mr. Pierce says a vast store of water from Millican Creek is running to waste and can be obtained by the construction of a pipe line 22 miles long. It is the only creek in Napa county that is running any volume of water at present. Mr. Pierce believes the supply is capable of producing three million gallons of water a day the year round.

SAN FRANCISCO, CAL.—Pacific Gas and Electric Company has acquired control of the water rights of the Pit river drainage for the installation of hydroelectric plants. The prolific sources in Shasta county are combined with those in Lassen and Modoc counties in broadly bounding the area secured. Work will be started immediately on a system of units which, when completed, will deliver to the San Francisco district and intermediate territory in Northern California more than 2,000,000,000 kw-hrs. of electrical energy annually. The economic gains already won through hydroelectric achievements in California, bringing world-wide fame and prosperity to the state, will be not only maintained but tremendously increased.

SAN FRANCISCO, CAL.—Pending installation of meters on all flat rate services the Mt. Whitney Power and Electric Company has been authorized by the Railroad Commission to collect its basic charge for electric energy plus a surcharge of 30 per cent. This collection method is authorized because of the inability of the company to install meters prior to the commencing of service. The basic rate, plus the surcharge, will make the rate equal to the rate fixed by the Commission in its recent decision, and will be collected in this way only for such time as the services are unmetered. A decision

by the Commission on March 23rd last abolished the company's flat rates. A recent order provides for a temporary restoration of the flat rate.

SACRAMENTO, CAL. — The Sacramento Northern Railroad Company, headed by G. F. Detrick and organized June 20, 1918, for the purpose of reorganizing the Northern Electric Railway Company, Sacramento and Woodland Terminal Company and the Marysville and Colusa branch of the Northern Electric Railway Company, has issued its financial report for the year ended December 31, 1919. In its income statement there is included net depreciation on way and structures amounting to $167,969, under the head "Railway Operating Expenses." The income balance, transferred to profit and loss, was reduced by current profit and loss entries, the principal item being a loss of $30,157 on retirement of the Hamilton branch, leaving a balance of $71,030, which was applied to amortize a like amount of the balance of $110,640 reorganization expenses.

THE PACIFIC SOUTHWEST

SPRINGER, N. M.—The Springer Ditch System Company contemplates the erection of another reservoir, to cost about $100,000.

LOS ANGELES, CAL.—An ordinance has been passed granting to the Pacific Electric Railway Company a franchise to construct a single railroad spur track upon Santa Monica Boulevard.

TUCSON, ARIZ.—A bond election will be held May 15, 1920, for the purpose of voting on a bond issue for $330,000 to be used for waterworks improvements, street improvements and ornamental street lighting.

PHOENIX, ARIZ.—An injunction has been filed by J. K. Doolittle, vice-president and general counsel for the Verde Water Power Company, asking that the Salt River Valley and Paradise Verde Water Users be enjoined from putting in a dam at Horseshoe Bend on Verde river.

PARADISE, CAL.—Owing to the present depressed condition of the bond market, directors of the Paradise Irrigation District have voted to reject all bids on the $140,000 bond issue recently voted. The bonds will be readvertised for sale at a later date, and the interest will fixed at not over 6 per cent.

CALEXICO, CAL.—It is reported that the Mexican Government contemplates the erection of a dam in the Colorado river, 15 feet high, in order to raise the water four feet at Hanlon heading during the low period. Yuma authority refused to allow a weir to be built by the Imperial Valley district.

LOS ANGELES, CAL.—A bond issue of $5,000,000, for the construction of an irrigation system and power plant, carried at the recent election. According to word received by W. E. Tussig, of South Pasadena, 27,000 acres on the east side of Mojave river will be benefited by the new project. Water is to be taken from Little Bear Lake.

TOMBSTONE, ARIZ. — Governor Campbell states that unless the U. S. Government shows more interest in reclaiming the arid lands of Arizona, the state itself will take steps to build the projects. The state can only issue $150,000 according to law, but the Governor has already under consideration plans for removing this limitation.

LOS ANGELES, CAL.—A contract has been let to the Palmdale Water Company for the construction of a dam in Little Rock Creek above Antelope Valley. The dam will provide water for the Palmdale and Little Rock irrigation districts. It will be 160 ft. high and of the multiple arch type. The water will be carried to Harold Lake, nine miles distant, then distributed.

BRAWLEY, CAL.—Engineer Sellow, formerly of the Reclamation Service and project engineer at Yuma, suggests turning the Colorado river back into its course, building levees at the south end of Volcano Lake, and there impounding a reservoir capable of storing a million and a half acre-feet of water. He also contemplates reversing the Solfatara Canal when the water supply in the Colorado runs too short for the territory irrigated. More than 200,000 acres of additional land can be irrigated west of New River by this means. Surveys will be necessary before a site for a permanent dam can be determined.

THE INTER-MOUNTAIN DISTRICT

PAYSON, UTAH.—Electric light rates in Payson have just been increased from 8c. per kilowatt-hour, the rate which has prevailed for several years, to 10c. per kilowatt-hour. Payson is served by the U. S. Government plant in Spanish Fork canyon.

SALT LAKE CITY, UTAH.—The Whitmore Oxygen Company, of Salt Lake City, has applied for permission to divert thirty second feet of water from Little Cottonwood Creek, to be carried by means of a flume and pipe line a distance of 6,250 feet, for the purpose of generating power at Wasatch, Utah.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company conducted a washing machine campaign during the month of March, the results of which were remarkable. During this one month 1711 washing machines were sold in this territory, where the population served is approximately 352,000.

BUTTE, MONT. — With organization work completed, representatives of the Montana Irrigation Congress, Montana Irrigation and Drainage Institute and the Yellowstone Irrigation Congress have adopted in tentative form an initiative bill to create a twenty-million-dollar revolving fund for the construction of irrigation projects throughout Montana.

SALT LAKE CITY, UTAH.—Having been granted a franchise in the town of Millville, Utah, to supply its inhabitants with electricity for light, heat, power and other purposes, the Utah Power & Light Company has filed with the public utilities commission of Utah a petition for a permit and certificate of convenience and necessity to exercise its rights under that franchise.

OGDEN, UTAH.—An application has been filed with the state engineer for 200 second feet of water from Ogden river. It is proposed to conduct this water 44,000 feet through a canal and a five and one-half-foot pipe line, and then drop it under 400-ft. head to develop 5,000 hp. of electric energy for the purpose of pumping water for irrigation in various parts of Weber and Boxelder counties.

FALLON, NEV.—Construction of the one hundred miles of ditches to effect drainage of the Newlands Project will commence by September 1. This is according to John L. Burkholder, drainage construction engineer of the United States Reclamation Service, who has arrived in Fallon from Denver to complete preliminary arrangements. Drag-line excavators will be used in digging the drainage system, and everything will be conducted along the most economic lines. A bond issue of $700,000 to finance the work was recently authorized by a vote of settlers.

SALT LAKE CITY, UTAH.—The petition of the Union Portland Cement Company of Ogden for a peremptory writ of prohibition to restrain the Utah Public Utilities Commission from considering a special contract entered into between the cement concern and the Utah Power & Light Company was denied on April 9th by the Supreme court of Utah. A similar order was issued in a like application of the Ogden Portland Cement Company against the Public Utilities Commission. These cases arose from an investigation by the Uublic Utilities Commission of special contracts entered into by the power company with seventy-nine corporations in the state.

BOISE, IDAHO—Although a city may have its own light plant, and so far as that plant is concerned be exempt from the regulation of the public utilities commission, when it contracts with a public utility company for service the service so contracted for is subject to regulation by the utilities commission the same as any other public utility service, it was ruled by the Public Utilities Commission of Idaho in the case of the application of the Utah Power & Light Company for permission to apply certain rates for standby service furnished the city of Idaho Falls. The city authorities protested on the ground that the commission had no authority over the contract.

SALT LAKE CITY, UTAH.—To promote the development of unexploited power resources in the Great Salt Lake Basin, Ralf M. Woolley, U. S. Geological Survey engineer, is compiling data on the operation of existing hydroelectric plants and favorable plant sites. This information will be published in book form by the Geological Survey office at Washington, D. C. There are approximately fifty hydroelectric plants in the basin at present, according to Mr. Woolley's statement. These generate about 160,000 horsepower. Mr. Woolley is of the opinion that there could be developed, in addition to this total, about 145,000 horsepower. An average of 15½ horsepower per square mile is generated in Utah, compared with an average of slightly more than 60 horsepower per square mile in Idaho.

SALT LAKE CITY, UTAH.—As a result of a movement which was inaugurated late in 1919 by the State Street Improvement Association, Salt Lake City will soon have a substantial addition to its Whiteway lighting system. The plans contemplate an immediate installation of Whiteway lighting of twelve blocks in the business district from State and Broadway, with a further additional installation at a later date. After conducting several tests as to lighting efficiency, the 6.6 ampere arc lamps were decided upon, three on each post, with seven standards per block, as now installed on Main St. The cast iron standard has been adopted, in a very attractive design. It is felt that the new lighting district will be the forerunner of still larger developments along this line, and with this addition to its present Whiteway lighting system, which is now considered one of the finest in the country, Salt Lake City will soon have a business district which, from a lighting standpoint, is unexcelled.

BOISE, IDAHO.—The Public Utilities Commission of Idaho has recently made a ruling whereby the patrons of public utilities who are not residents of a municipality in the state of Idaho which demands and receives any free service or receives payment in the way of an occupation tax, shall be relieved of the burden of paying or contributing indirectly to such municipality; and all public utilities over which the commission has jurisdiction, are ordered to file with the commission a statement showing the name of each municipal corporation receiving such tax or free service, the amount of money paid, the value of any free service rendered, the value of any service rendered which is not charged for at regular rates, and the difference between the charge made and that provided by the regular rate; also the cost of installation, maintenance and operation of any excess or duplicate installation or equipment. The public utilities must also submit a proposed change of rate or rates applicable only to their patrons within the limits of the municipality requiring such payment as shall result in an increased income sufficient in the aggregate to offset the money payment, or service furnished or increased cost of operation demanded by such municipality, which shall be proportioned among all the patrons of the utility within the limits of such municipality as equitably as may be, and shall be provided to be collected in the most inexpensive and practicable method.

"IN THE SPRING——"

When the order clerks are stupid
And the office boy is green;
When the rings and cleeks in business
Are the worst you've ever seen;
When you're tired of all the city clubs,
And bored with tees and balls;
When you think you'll pawn your cuff links
Till the cost of living falls;

Then it's time to plan Del Monte
Where the Jobbers all convene,
And use the iron in your soul
To putt upon the green;
And when you're in the swing of it,
You'll tell the H. C. L.
That stymied you a while ago
To take itself to—oh, anywhere.

D. E. E.

* * *

We are always saying that there is nothing electricity can't do, and information which has recently reached us assures us that people will soon be keeping batteries in their cellars and snapping their fingers at the eighteenth amendment. A San Francisco physician has succeeded in dividing electric vibrations in such a manner as to produce the effect of alcohol upon the human body. He recently demonstrated to a few select friends the mechanism which produces the alcoholic waves, and we have it on good authority that the aforesaid friends staggered from his office in various stages of blissful intoxication.

Another argument for the electrical home.

* * *

A safety provision that seems to have been overlooked by most railway companies is brought out in the story of the president of a small line who once waited on a railroad magnate to request an exchange of courtesies.

"On our line, sir," said he proudly, "not only has a collision never occurred, but on our line a collision would be impossible." "Impossible?" said the other, "oh, come; I know that the latest automatic safety devices are excellent things, but Impossible is a large word." "It's literally true with us, sir," was the reply. "How can it be?" asked the magnate. "Why, said he, "we own only one train."

There may be safety in numbers, but they should be small numbers.

Names such as Smith and Brown have their compensations. Few things are more pathetic, for instance, than an eleven-syllabled customer helping the store clerk make out the charge check. In the case of the telephone, your name may lead to the severing of diplomatic relations, as in the following friendly dialogue:

"Are you there?"
"Yes!"
"What's your name?"
"Watt's my name."
"Yes, what's your name?"
"I say my name is Watt. You're Jones?"
"No: I'm Knott!"
"Will you tell me your name?"
"Will Knott."
"Why won't you?"
"I say my name is William Knott."
"Oh, I beg your pardon!"
"Will you be in this afternoon if I come around?"
"Certainly, Knott."

After which they rang off.

Another case on record is of two doctors, name Paradise and Hellser, who shared an office. The telephone rang and a voice asked:

"Is this Paradise?"
"No, this is Hellser."
"Oh—the devil!"

* * *

When we were young we used to sing an ancient ditty running as follows:

"The famous Duke of York
He had ten thousand men.
He marched them up to the top of a hill
And he marched them down again.

And when they were up they were up,
And when they were down they were down,
And when they were only half-way up
They were neither up nor down."

We have never heard the second stanza questioned, but in a local newspaper we find an item which opens thus:

"The King of France marched ten thousand men up and down a hill because he wanted a place in history."

Either we have been misled from our early youth, or else this particular form of military activity was a singularly popular pastime in former days.

* * *

If you fall overboard, make a point of doing it in the presence of a fluent talker. The following story will explain a piece of advice that may seem somewhat obscure:

Among the passengers on a ship was a man who stuttered badly. One day he hurried up to the captain and started: "Th-th-the——"

"I'm very busy, now," interrupted the captain. "Tell the mate here."

But the mate was also busy, and the stutterer tried everyone else in sight without success. Finally he came back to the captain.

"Look here, man, sing it! That's the only way," urged the officer.

Whereat the man chanted in a tragic voice:

"Should auld acquaintance be forgot and never brought to mind? The blooming cook fell overboard and is twenty miles behind."

* * *

Colored patient in hospital: "Boss, how do you-all do youah cookin' in thah?"

Orderly: "Well, Sam, you know we have the latest fandangled methods over here; in fact, we do our cooking by electricity."

Colored patient in hospital: "Well, boss, you sho' ought to have given dem beans another shock."